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WELCOME ADDRESS

As we entered the 21st century, the rapid growth of information technology has changed our lives more conveniently than we have ever speculated.

Recently in all fields of the industry, heterogeneous technologies have converged with information technology resulting in a new paradigm, IT convergence, and people have been breaking the limit and finding other possibilities of IT research and development through converging with various industries and technologies.

The goal of this conference is to discover a new progressive technology by upgrading the previous technologies and to solve the technical problems that may have occurred in the process of converging technology in various fields of industry.

The International Symposium Innovation in Information Technology Application (ISIITA) 2021, the world's premier networking forum of leading researchers in the highly active fields of information technology application, will be held in Yeosu, South Korea. The ISIITA 2021 will include oral and poster sessions as well as tutorials given by experts in state-of-the-art topics.

IT experts, researchers, and practitioners from each field are invited to share ideas and research technologies; moreover, encouraged to cooperate with each other to overcome the confronted technical problems. As a result, this conference will become a place of knowledge where a variety of effects can be created.

We are proud to invite you to Yeosu, which is a perfect setting for the Joint Conference. We truly hope that you will have a technically rewarding experience as well as some memorable experiences in Yeosu. It is our hope that you are participating in 2021 ISIITA will be a rewarding experience and that you will get a chance to meet other colleagues working in the exciting area of industrial information systems. We are all looking forward to seeing you in Yeosu, South Korea (Republic of Korea).

A sincere welcome awaits all visitors at the joint conference.

Jong Sung Kim (Andong Univ. Korea) and Sang hyuk LEE (XJTLU. China)

General Chair of ISIITA 2021

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PROGRAM

Time	Content
August. 23. (Monday)	
Zoom Meetings	ID: 811 7514 5763 / PW: isiita01 https://us02web.zoom.us/j/81175145763?pwd=Zyt1Y2dKVkN6S2U0QWNBUVBYWWRKdz09
15:00 ~ 17:00	[Session 1] On/Offline Presentation
August. 24. (Tuesday)	
Zoom Meetings	ID: 862 3091 7867 / PW: ISIITA01 https://us02web.zoom.us/j/86230917867?pwd=YlZoRG1XcFhyUjhLZENEWnQvWXE3dz09
10:00 ~ 10:20	Registration + Opening (Zoom Live & Offline)
10:20 ~ 11:00	Keynote Speech 1 - Dr. KI PYUNG KIM (Zoom Live & Offline)
11:00 ~ 11:20	Break
11:20 ~ 12:00	Keynote Speech 2 - Dr. T.Velmurugan (Zoom Live & Offline)
12:00 ~ 13:30	Lunch
13:30 ~ 14:50	[Session 2] Presentation (Zoom Live & Offline)
14:50 ~ 15:10	Coffee Break
15:10 ~ 16:30	[Session 3] Presentation (Zoom Live & Offline)
16:30 ~ 17:50	[Session 4] Poster Presentation (Offline)
August. 25. (Wednesday)	
10:00 ~ 13:00	[Session 5] Video Presentation

※Times are expressed in KST(GMT+9).
※The schedule is subject to change due to various circumstances. (Subject to Change Without Notice.)
※Online = Zoom Live

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August 23, Monday

(No Lunch Provided)

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	S1-2	**Design a Novel State of Charge Estimation Algorithm based on an Artificial Neural Network for Lithium-ion Batteries in a Smart** Manh-Tuan Ngo / Changwon National University / Republic of Korea Van Quan Dao / Changwon National University / Republic of Korea Minh-Chau Dinh / Changwon National University / Republic of Korea Chang-Soon Kim / Changwon National University / Republic of Korea Bai Zhiguo / IES Co., Ltd, Busan / Republic of Korea Minwon Park * / Changwon National University / Republic of Korea
	S1-3	**Design of data preprocessing recommendation algorithm for deep learning model learning** Hyeonji Kim / ICT Convergence, Dept. of AI, Daegu University / Republic of Korea Yoosoo Oh* / ICT Convergence, Dept. of AI, Daegu University / Republic of Korea
	S1-4	**Design of Medical Image Information Classifier to Improve the Accuracy of Lung Cancer Diagnosis** Minuk Jeong / ICT Convergence, Dept. of AI, Daegu University / Republic of Korea Yoosoo Oh* / ICT Convergence, Dept. of AI, Daegu University / Republic of Korea
	S1-5	**Electric kickboard safety regulation violation checking system using image classifier** SeongU Yun / ICT Convergence, Dept. of AI, Daegu University / Republic of Korea Sehui Yoo / ICT Convergence, Dept. of AI, Daegu University / Republic of Korea Yoosoo Oh* / ICT Convergence, Dept. of AI, Daegu University / Republic of Korea

August 24, Tuesday

Time	Content
10:00 ~ 10:20	Registration + Opening (Online & Offline)
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11:00 ~ 11:20	Break
11:20 ~ 12:00	Keynote Speech 2 - Dr. T.Velmurugan (Online & Offline)
12:00 ~ 13:30	Lunch

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	S2-2	**Cognitive Rehabilitation Assistance System for the Elderly Utilizing Eye-tracking Module** Dongwook Song* / GWNU, Wonju, South Korea Jihyun Lee / Silla System, Inc., Daegu, South Korea Hwanseok Kim / GWNU, Wonju, South Korea Sungphil Heo / GWNU, Wonju, South Korea
	S2-3	**Simulation of self-capacitance for capacitor type distance sensor** Kanghyun Kim / Department of Mechanical Engineering, POSTECH / Republic of Korea Geumbae Lim* / Department of Mechanical Engineering, POSTECH / Republic of Korea
	S2-4	**Exploring the Correlation between COVID-19 Outbreaks and Social Media Patterns** Michael Terry / Bowling Green State University / Northeastern United States Vagish Vela / Bowling Green State University / Northeastern United States Kshitij Saxena / Bowling Green State University / Northeastern United States Mitchell Pandy / Bowling Green State University / Northeastern United States Jong Kwan Lee* / Bowling Green State University / Northeastern United States Michael Decker / Bowling Green State University / Northeastern United States
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Time	[Session 3] Presentation (Online & Offline) Session Chair: Sanghyuk Lee (Xi'an Jiaotong-Liverpool University)	
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	S3-2	**Using HOMER for sizing hybrid pv/wind/hydrokinetic/battery energy system for Isolated City in Egypt (Shalateen)** Mohamed Nayal / Department of Electric Engineering, Faculty of Engineering, Assuit university / Egypt mahmoud aref /Department of Electric Engineering, Faculty of Engineering, Assuit university / Egypt safaa saleh* / department of Electric Engineering, Faculty of Engineering, Assuit university / Egypt
	S3-3	**An Analysis of Diabetics Data Using k-Means Clustering Algorithm** T. Velmurugan / PG and Research Department of Computer science, D. G. Vaishnav College / India A.Dharmarajan / Department of Computer Science, Ayya Nadar Janaki Ammal College, Sivakasi / India
	S3-4	**Information flow in networked system with leaderless structure** Zhongnan Liu / Xi'an Jiaotong-Liverpool University, Suzhou / China Fan Yang/ / Xi'an Jiaotong-Liverpool University, Suzhou / China Kaiwen Chen / Xi'an Jiaotong-Liverpool University, Suzhou / China Sanghyuk Lee*/ Xi'an Jiaotong-Liverpool University, Suzhou / China

Time	[Session 4A] Poster Presentation (Offline & Video) Session Chair: Jonghun Lee (DGIST), Donghwa Lee (Daegu University)	
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	S4A-2	**Design and Implementation of Self-Instruction Training Application on Wearables** Hyoseok Yoon* / Hanshin University / Republic of Korea Seong Beom Kim / Hanshin University / Republic of Korea Nahyun Kim / Hanshin University / Republic of Korea
	S4A-3	**Using RGB Sensor to Develop a Mini-size Portable Urine Analyzer** Soo-min Lee / Graduate School of Medicine, Keimyung University / Republic of Korea Bu-seong Kim / Graduate School of Medicine, Keimyung University / Republic of Korea Jung-woo Koo / School of Medicine, Keimyung University / Republic of Korea Hee-jun Park / School of Medicine, Keimyung University / Republic of Korea Wei Qun * / School of Medicine, Keimyung University / Republic of Korea
	S4A-4	**Development of Skeleton Action Recognition to Secure Human using Artificial Intelligence** Vasanth Ragu / Daegu Gyeongbuk Institute of Science & Technology / Republic of Korea Jongcheol Lee / Daegu Gyeongbuk Institute of Science & Technology / Republic of Korea Hyunki Lee* / Daegu Gyeongbuk Institute of Science & Technology / Republic of Korea
	S4A-5	**System design of dynamic safety assistant monitoring based on multi-radar for construction heavy vehicles** Seungeon Song / DGIST / Republic of Korea Hyeuk-Dong Kweon / Dong-A Metal Co., Ltd/Korea / Republic of Korea Jonghun Lee* / DGIST / Republic of Korea

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	S4B-2	**Development of user-customized spinal acupoint medical device through measurement of biometric information** Dohyun Ahn / Kyungpook National Univ., / Republic of Korea Sung-Phil Heo / Gangneung-Wonju National Univ., / Republic of Korea Hyeonu – Cho / Kyungpook National Univ., / Buk-gu, Daegu, Korea / Republic of Korea Jongmin Lee / Kyungpook National Univ., / Buk-gu, Daegu, Korea / Republic of Korea
	S4B-3	**Image Processing-based Industrial Safety Monitoring System** Soohwan Kim / Daegu University / Republic of Korea Seongmin Kim / Daegu University / Republic of Korea Donghwa Lee* / Daegu University / Republic of Korea
	S4B-4	**Towards IoT enabled Predictive Agriculture using MicroclimateData** Aekyung Moon* / ETRI / Republic of Korea Juyoung Park / ETRI / Republic of Korea Yun Jeong Song / ETRI / Republic of Korea
	S4B-5	**Development of auto inspection system for Defect Detection of Automotive Rubber Boot** Donghwoon Kwon / Rockford University, Rockford / USA Tae Han Kim / Daegu University / Republic of Korea Jeong-tak Ryu / Daegu University / Republic of Korea
	S4B-6	**A novel method for precise measurement of Displacement using Eddy currents** Ik Hyun Kwon / Department of Bio-ICT Engineering, Graduate School, Andong National University /Korea Cheong Worl Kim / Department of Electronic Engineering Education, Andong National University, Korea

August 25, Wednesday

(No Lunch Provided)

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	S5-2	**A practical approach for aspect-level sentiment analysis in the Korean online shopping malls** Hyo-Seok Seo / Hanyang University / Republic of Korea Heejung Lee* / Hanyang University / Republic of Korea Hyo-won Suh / KAIST / Republic of Korea
	S5-3	**Gain Enhancement of Microstrip Patch Array Antenna using Metallic Horn Structure for RADAR Applications** Junho Yeo / Daegu University / Republic of Korea
	S5-4	**Audio Quality Restoration Method using Convolutional Neural Network** Hong-Jin Kim / Daegu University / Republic of Korea Kyuman Jeong* / Daegu University / Republic of Korea
	S5-5	**Improving the Tonometry Digital Arterial Pulse-Wave Analyzer Performance by Using ICT and Development of Its Healthcare Service** Hojong Chang / KAIST / Republic of Korea Yongho Kim / CN Frontier Co.,Ltd. / Republic of Korea Byunghun Han / KAIST / Republic of Korea Kyungdon Choi / CM Data, Ltd. / Republic of Korea Chae-Seok Lee / KAIST / Republic of Korea Heejung Kang / DAEYOMEDI Co., Ltd. / Republic of Korea Youngsang Kun / DAEYOMEDI Co., Ltd. / Republic of Korea Hyoungho Nam / CN Frontier Co.,Ltd. / Republic of Korea

Real-time variable inductance measurement method for SI-SFCL performance analysis

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The saturated iron core (SI) type superconducting fault current limiter (SFCL) is one of the typical types of SFCL and is being actively studied. The SI type SFCL works by reducing the fault current by non-linearly increasing the inductance. Therefore, it is important to accurately analyze the variable nonlinear inductance for design and performance analysis of the SI-SFCL. In this paper, a method for calculating the nonlinear transient inductance characteristics of SI-SFCL applicable to DC systems was proposed and verified. A 500 V, 50 A class DC system was selected as the target. A lab-scale SFCL to be applied to a DC system was designed and manufactured. The nonlinear inductance obtained through the FEM analysis performed during the SFCL design process and the nonlinear inductance obtained from the experimental results were compared and analyzed. As a result of the comparison, the similarity of the inductance obtained in the two processes is sufficiently meaningful. These results can be applied to analysis techniques such as hardware in the loop simulation for real-time system analysis in the future.

Keywords- DC-SFCL, Inductance measurement method, Satureated iron core SFCL, Superconducting fault current limiter

We present two methods to calculate the nonlinear inductance of the SI-SFCL. The first one is a method of calculating the nonlinear transient inductance of the SI-SFCL using the magnetic properties of the iron-core. In this method, firstly, the magnetic properties of the iron-core including B-H curve and relative permeability are estimated. This process is implemented in the SW because the resistance of the superconducting wire is very small. Isolate the PW from the DC system and make it an open circuit and increase the current to a ramping rate of 1 A/s in the SW of the SI-SFCL, and then measure the voltage and current of the SW over time, t. The total flux linkage, Φ of the SW can be calculated from the measured voltage V_{sec} as follows:

$$\Phi(i_{sec},t) = \int V_{sec}(t)dt \qquad (1)$$

From this result, we can determine the transient magnetic flux density $B(i_{sec},t)$ of the iron-core. Next, the magnetic field strength $H(i_{sec},t)$ is calculated from the measured current $i_{sec}(t)$, the number turns of the SW N_{sec} and the length of the magnetic path l_m in the core as below:

$$H(i_{sec},t) = \frac{N_{sec} \times i_{sec}(t)}{l_m} \qquad (2)$$

Thus, the B-H characteristics of the iron-core is defined, from there it is easy to calculate the relative permeability of the iron-core. From the estimated B-H characteristic, the relationship between the magnetic field strength H and the relative permeability μ_r, $(H - \mu_r)$ is defined. The transient magnetic field strength $H(i_{pri},t)$ of the primary side of the core is calculated from the measured fault current i_{pri} from FEM analysis or experiment and the SW current i_{sec} during the fault:

$$H(i_{pri},t) = \frac{N_{sec} \times i_{sec}(t) - N_{pri} \times i_{pri}(t)}{l_m} \qquad (3)$$

where, N_{pri}, N_{sec} are the number turns of the PW and SW, respectively. From this result and the $H-\mu_r$ curve, the transient relative permeability $\mu_r(i_{pri},t)$ is determined. And then we can estimate the transient inductance of the PW using equation:

$$L_{pri}(i_{pri},t)=\frac{N_{pri}^2\times A_{core}}{l_m}\times\mu(i_{pri},t) \qquad (4)$$

where, A_{core} is the cross-sectional area of iron-core. This equation allows the time-varying transient inductance value to be calculated by considering the time-varying permeability according to the current change instead of the conventional equation for calculating the constant inductance value [1].

The second method is to calculate the inductance from transient voltage and current. The transient voltage and current can be obtained through FEM simulation or measured in experiments. In the VSC based DC system, the DC fault current is caused by discharging the DC-link capacitor in a very short time, about several milliseconds. At this time, the voltage changes of the PW that appears during discharge is as follows:

$$V_{pri}(t)=i_{pri}(t)\times R_{pri}+\frac{d\Phi(i_{pri},t)}{dt}$$

$$=i_{pri}(t)\cdot R_{pri}+L_{pri}(t)\frac{di_{pri}(t)}{dt}+i_{pri}(t)\frac{dL_{pri}(t)}{dt} \qquad (5)$$

where, R_{pri} and $\Phi(i_{pri},t)$ are the resistance and the total flux linkage of the PW, respectively. The interaction of current and inductance can be confirmed through the equation (5). Based on the equation (5) the primary inductance over time $L_{pri}(t)$ can be determined from the measured voltage and transient fault current in the PW as below:

$$L_{pri}(t)=\frac{(V_{pri}(t)-i_{pri}(t)R_{pri})dt-i_{pri}(t)dL_{pri}(t)}{di_{pri}(t)} \qquad (4)$$

In order to calculate $L_{pri}(t)$ through the FEM analysis or the experimental measurement data by applying equation (6), it is necessary to convert it for use in the time domain. If dt in equation (6) is set as time-step (Δt) of FEM analysis or experimental measuring instrument, $di_{pri}(t)=i_{pri}(t_n)-i_{pri}(t_{n-1})$, $dL_{pri}(t)=L_{pri}(t_n)-L_{pri}(t_{n-1})$ can be substituted, where, t_n is the current time step and t_{n-1} is the previous time step. Through this conversion, the nonlinear inductance can be calculated easily from FEM and experimental results.

The first proposed method requires precise characteristics depending on the shape and material of the core, whereas the second method requires only the current and voltage of the PW. The exact properties of the core are generally very difficult to obtain. Therefore, it is difficult to use the first method at the design stage to improve the design. On the other hand, the behavior of the SI-SFCL transient voltage and current can be obtained relatively easily through FEM analysis or experiment.

Acknowledgment

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References

1. Grover, Frederick W. Inductance calculations: working formulas and tables. Courier Corporation, 2004.

Design a Novel State of Charge Estimation Algorithm based on an Artificial Neural Network for Lithium-ion Batteries in a Smart Battery Management System

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[2)] **IES Co., Ltd, Busan, Republic of Korea**

State of charge (SOC) is a critical and essential factor to ensure the Lithium-ion battery (LiB) operate safely and reliably, preventing the battery from being damaged or premature aging. This paper deals with a SOC estimation algorithm for a LiB based on an artificial neural network (ANN). First, the real battery dataset in the past was investigated for the network training. Then, the configuration of the ANN was built with the input layer, hidden layer, and output layer. Through training and testing processes, other design factors of the ANN were determined. As a result, the designed network was capable of effectively estimating the SOC for different temperatures and initial conditions. The tested maximum and average errors were 2.4% and 0.35%, respectively. The results of this study can be effectively applied to accurately estimate the SOC of a LiB pack in an energy storage system.

Keywords- Lithium-ion battery, State of Charge, Artificial Neural Network

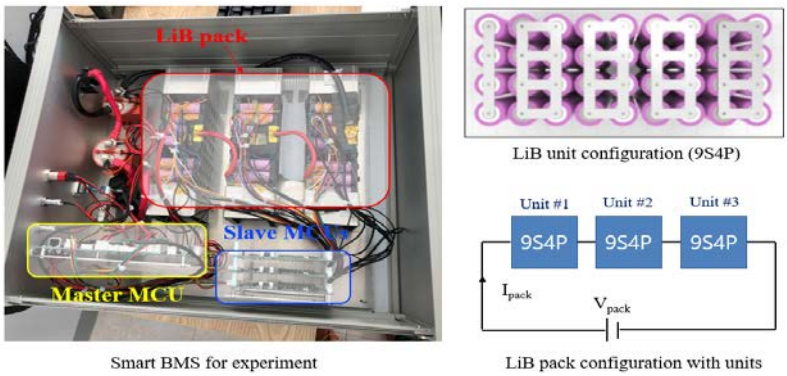

Figure 1. Configurations of the smart BMS and LiB pack

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3. Wen-Yeau Chang, "The State of Charge Estimating Methods for Battery: A Review", International Scholarly Research Notices, vol. 2013, Article ID 953792, 7 pages, 2013.

Biography

(Corresponding Author) Park Minwon was born in Republic of Korea in 1970. He received the B.S. degree in electrical engineering from Changwon national University in 1997 and his M.S and Ph.D degrees in Electrical Engineering from Osaka University in 2000 and 2002, respectively.

Design of data preprocessing recommendation algorithm for deep learning model learning

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To ensure the integrity of collected data in deep learning, we need to apply the data preprocessing process. This paper proposes an algorithm that identifies the learning data type and recommends the data preprocessing method for deep learning. Learning in deep learning models has different preprocessing processes depending on image files (jpg, png, etc.) and numerical files (CSV, XML, etc.). Thus we classify collected data as numeration and image files using file extensions to determine the file type. Then we use knowledge-based filtering techniques to recommend the data preprocessing process for the deep learning model. In addition, we utilize Titanic's analytical data set as training datasets to evaluate recommendation algorithms.

Usually, numerical files are less accurate in the learned model when outliers exist. Accordingly, the numeration file uses the mean and standard deviation among learning data to explore outlier values and perform preprocessing to remove outlier values or replace them with others. Primarily, we apply z-score and z-test methods to explore outliers. Image files in a deep learning model perform preprocessing that changes the image's size, color, etc. Also, the proposed method receives input from the user and processes the image size and data type required for the deep learning model.

Moreover, this paper designs an algorithm that uses a knowledge-based filtering model to recommend suitable preprocessing methods according to the numerical file and image file. In particular, the proposed recommendation algorithm recommends preprocessing techniques such as removing missing values, substituting missing values, and inserting predicted values depending on the presence or absence of abnormal data in the case of a numerical file. Furthermore, in an image file, pre-processing methods such as image size change, image transparency processing, color classification, and boundary detection are recommended.

Consequently, we compare the recommended preprocessing method with the pretreatment method by user analysis to evaluate the proposed recommended algorithm. For evaluation, we use the dataset, which is the collected data concerning Titanic. As experimental results, we obtained that the proposed preprocessing method has higher result values than the existing preprocessing method performed by user analysis.

Keywords- Preprocessing; Recommendation Algorithm; Knowledge-Based Filtering

Acknowledgment

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Design of Medical Image Information Classifier to Improve the Accuracy of Lung Cancer Diagnosis

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According to the Korea Consumer Agency, out of 645 applications for medical damage related to misdiagnosis received from 2012 to 2016, 374 cases (58% of all applications) were misdiagnoses of cancer. Most of them were cancer, but 81.4 percent misdiagnosed as non-cancer, and 8.6 percent misdiagnosed as cancer. The most common causes were the image reading error and negligence of additional examination. Among the cancer types, lung cancer is most often misdiagnosed. Also, as the diagnosis is delayed, so cancer already advances and usually occurs at stage 3 or stage 4. According to the Disease Policy Division of the Ministry of Health and Welfare, the incidence of lung cancer (people per 100,000 population) increased every year from 28 in 1999 to 55.8 in 2018, doubling. The death rate also increased every year from 22.1 in 1999 to 34.8 in 2018. In 2019, lung cancer was the number one cause of death from cancer.

In this paper, we design and implement a lung cancer diagnosis system using medical image data of individuals. The proposed system obtains a dataset with medical images acquired from The Cancer Imaging Archive (TCIA) of the National Cancer Institute (NCI). Our system trains the constructed dataset using a CNN (Convolutional Neural Network) model widely used in deep learning. Our system receives medical images from users for cancer diagnosis and then applies the CNN model to learn the obtained dataset. It then uses the trained CNN model to analyze new medical images and reasons out their results. Our system is developed for medical image readers and doctors. With the learning results of medical images, our system can reduce the false positive by comparing the other conventional methods.

Keywords- Deep Learning, CNN, Lung Cancer

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Violation Checking System of Electric Kickboard Safety Regulation using Image Classifier

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As the safety accidents of electric scooters have been increasing, the electric kickboard-related legislation was revised in 2020. The revised road traffic law about kickboards is mandatory to wear helmets and bans the onboarding of any passenger when driving electric kickboards. In this paper, we propose a system for checking violations of safety regulations for electric kickboards using an image classifier. First, the proposed violation enforcement system is installed where shared kickboards are frequently parked and stopped. Also, when driving an electric kickboard, our system determines whether the driver has worn a helmet and whether the passenger is on board or not. Then, our system emits a warning sound when the law is violated. The proposed system consists of MCU, camera, and buzzer. The proposed system implements the OpenCV to receive real-time video from the camera connected to the MCU and then estimates the violation of the law using the YOLO algorithm. In this paper, we compare and analyze the fastest v5s and the most accurate v5x among the four types of YOLO v5s, v5m, v5l, and v5x, and we adapt the exact algorithm. Our system determines whether the recognized person wears a helmet with the object recognition after receiving and learning the helmet/head dataset. We then establish a bounding box for the total size of objects recognized as human beings and objects recognized as electric kickboards to determine whether a passenger is on board or not. If our system recognizes two or more persons within the bounding box area of the electric kickboard, it estimates a passenger with our violation policy. Also, the proposed system makes an alarm when an electric kickboard driver is not wearing a helmet, or more than one person is on board. Accordingly, the proposed system encourages that electric kickboard drivers drive in a safe state. Therefore, the proposed approach is expected to reduce injury in an accident by wearing a helmet and reducing the risk of an accident by riding a single person.

Keywords- Yolo, kickboard, detect , MCU

Acknowledgment

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Estimation of Shrimp Orientation by using grid map-based algorithm

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Recently, global efforts have been made to improve the quality of food. In particular, shrimp is used as a food ingredient loved by many people. The automation process helps to increase the price competitiveness of shrimp and provide them to more people. It is important to know the direction of the target to handle the automated process of such shrimp. This is because if the direction is incorrectly recognized when moving shrimp through robot grippers, the quality of shrimp can decrease.

To address this problem, we propose a grid map-based orientation inference algorithm in this paper.1496 shrimp photographs were used to experiment with the proposed algorithm. The location of each shrimp was labeled square and the shrimp direction was presented based on the researcher's perception.

In this work, orientation is predicted in three stages. Primarily, the shrimp was found through object detection. Second, the shrimp image was simplified through preprocessing. Third, we infer directions with a direction map-based orientation inference algorithm. Object detection showed approximately 99% prediction success rate, and direction prediction mostly showed a satisfactory success rate. In the future, we will build an algorithm that can be used in real fields by collecting additional images passing through the real conveyor belt in factories.

Keywords- Deep learning, Orientation estimation, Object detection

Acknowledgment

This work was supported by the DGIST R&D Program of the Ministry of Science, ICT and Future Planning (21-ST-01, 21-DPIC-07) and the Ministry of Trade, Industry and Energy (MOTIE) through the Industrial Core technology Development Project (20003781).

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Cognitive Rehabilitation Assistance System for the Elderly Utilizing Eye-tracking Module

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Despite the rapid increase of demand for rehabilitation treatment and due to aging of the population in Korea, the number of hospital beds in charge of rehabilitation treatment is far insufficient compared to that of major advanced countries in the world, and socio-economic burden is accumulating. To address the issue, various devices and software has been researched and developed for more effective treatment, but a design or a method utilizing an eye-tracking module has not much been attempted. In this study, a rehabilitation program using an eye-tracking module is designed, which will enable more intuitive, interactive, and immersive treatment. Computer vision-based eye-tracking function is designed. User biometric information and activity logs are stored in the database, and customized services are provided for different users. Game-type cognitive rehabilitation contents playing with eye-tracking module is provided. Through this study, we propose a more cost-effective way of cognitive rehabilitation and dementia prevention in hopes it can contribute to alleviate the growing socio-economic concern of super-aging, and help the elderly to maintain a healthy and independent life in the long-term.

Keywords- rehabilitation assistance; eye-tracking; cognitive rehabilitation; digital health care;

Acknowledgment

The work was supported by the Field-oriented Science and Engineering Talent Nurturing Uupport Project of The National Research Foundation of Korea funded by the Ministry of Science and ICT of Korea government(NRF-2017H1D8A1029391).

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Biography

Dongwook Song was born in Seoul, South Korea in 1987. He received the B.B.A degree in international management from the University of Ritsumeikan Asia Pacific University in 2013.

Simulation of self-capacitance for capacitor type distance sensor

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Distance is addressed critically in lots of industrial and academic field, both. Especially, as the development of the technology, nm scale resolution has been required. To measure the distance, the interferometry, ultrasonic transducer, inductor has been widely used. The capacitance can be used, and has advantages in non-invasive, target material independence, productivity, and high resolution. [1] In addition, planar type capacitance sensor, whose electrodes were arranged one-side, can reduce the complexity of the system. The capacitance can be measured between the electrode and the ground, self-capacitance. However, the distortion of the electric field produces the non-linear response of the capacitance. [2] It means that the sensor will be calibrated by the calculation of the capacitance

Here in, we calculated the self-capacitance of the planar capacitance according to the distance by COMSOL software, which is based on the finite element method. To evaluate the calculation, we introduce a planar type capacitor sensor made by Micro Electro Mechanical System (MEMS), and the measured capacitance was compared with the calculation. Both data showed the non-linear response as we previously expected, and similar values. The difference between the data was affected by circumstance such as the temperature, humidity and the other conductors.

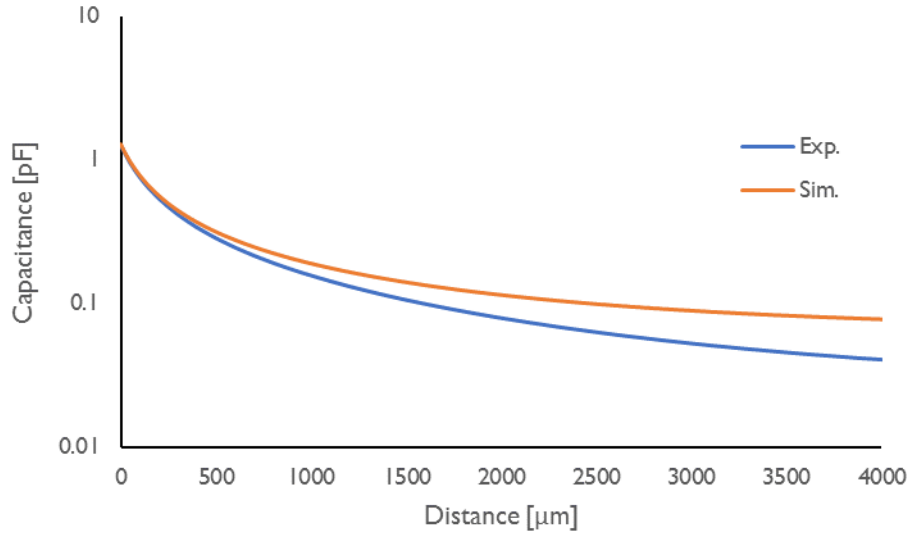

Figure1

Fig. 1. Comparison between the experimental data and the COMSOL simulation data in glass

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Acknowledgment

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Biography

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Exploring the Correlation between COVID-19 Outbreaks and Social Media Patterns

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The use of AI and Machine Learning (ML) in health care applications has been explored in many years. For example, the MYCIN system developed in the 1970s represented the first attempt to leverage AI in suggestive decision support for medical professionals. More recently, a variety of AI and ML techniques have been leveraged to assist in the screening, predicting, contract tracing, and diagnosis of COVID-19 positive suspected patients (e.g., [1-3]). In this project, the correlation between COVID-19 outbreaks and social media patterns is studied by exploring machine learning. Specifically, the Panacea Lab COVID-19 Twitter data [4], which has simple twitter metadata for tweets with specific keywords, and the global COVID-19 case data provided by the John Hopkins Center for Systems Science and Engineering [5] are considered by statistical analysis and a machine learning algorithm to examine the correlation between the data and to validate the social media data as an input for the prediction of COVID-19 spread. In our study, the scikit-learn's MLPRegressor, which is a multi-layer Perceptron regressor [6], is considered for the prediction.

The MLPRegressor with a 3-layer network of 100 nodes in each layer was trained with tweet counts using 80/20 split for training and validation. Figure 1 shows the pair plots of daily tweets versus daily cases and daily deaths. As shown in the figure, there seems to be a negative correlation between tweets and cases, while there does not seem to be any correlation between tweets and deaths. Figure 2 shows the correlation between daily tweets and daily cases in detail. As shown in the figure, there is an inverse correlation between the two as there are more cases, there are less tweets. The linear regression formulate for the inverse correlation is: Daily Cases = -0.099×Daily Tweets + 628,737. The linear regression suggests that for every 10 tweets, there was a reduction in one COVID-19 case. Table 1 shows the correlation of daily tweets, cases, and deaths.

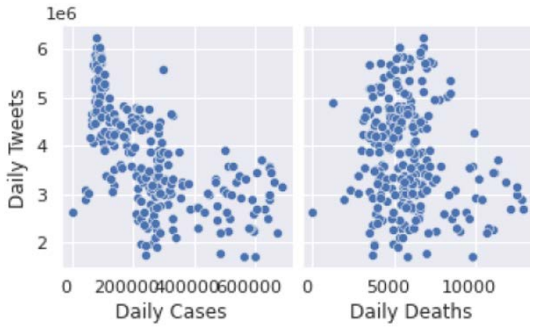

Fig. 1. Pair Plots of Daily COVID-19 related Tweets, Cases, and Deaths

TABLE 1
Correlation of Daily Tweets, Cases, and Deaths

	Tweets	Cases	Deaths
Tweets	1.0000	-0.6481	-0.1659
Cases	-0.6481	1.0000	0.6783
Deaths	-0.1659	0.6783	1.0000

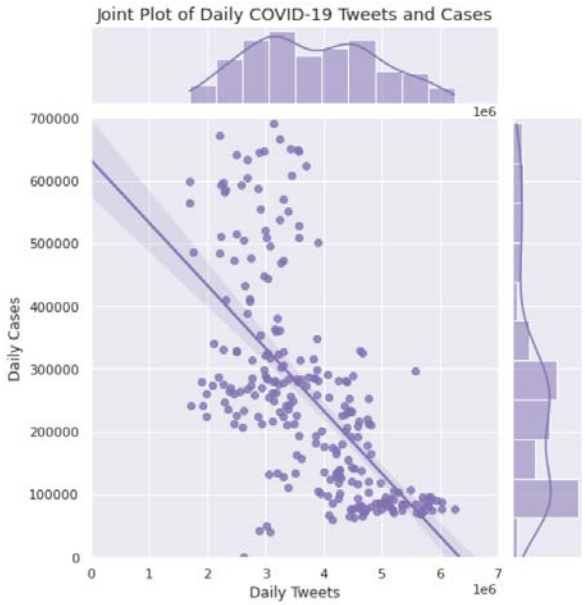

Fig. 2. Linear Regression with Marginal Distributions of Daily COVID-19 related Tweets against Cases

In this study, we explored machine learning and found an inverse correlation between the Twitter tweets and daily COVID-19 cases. While this is a preliminary result, we believe that the approach can be extended into a more extensive study which can be used to save many lives by predicting the spreads of infectious diseases.

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Biography

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Investigation of Hydrogen generation Using Wind Energy in Northern Red Sea

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In the present work, there is a clear interest in producing hydrogen from wind farms in Egypt. To achieve the purpose of this work is allowed to do a Statistical analysis of Wind energy Characteristics which makes wind turbines have more impact on hydrogen production in various sites of Egypt. The suitable location of a wind turbine is a vital step in designing a wind farm. Therefore, a feasibility study allows determining the wind speed distribution of various sites in Egypt, which is obtained from the Egypt wind map. It is revealed that there are seven classes of annual average wind speed, with minimum and maximum speeds of 5.1 m/s and 10 .35 m/s, respectively. The results show that the northern Red Sea annual average speed of 10.35 m/s is suitable to generate electricity and use it in hydrogen production at a reasonable costs

Using HOMER for Sizing Hybrid PV/Wind/Hydrokinetic/Battery Energy System for Isolated City in Egypt (Shalateen)

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Remote areas do not have connection to electricity network. Moreover, using conventional resources are not feasible, as they cause a lot of greenhouse gases (GHG) which increase the effect of global warming. Such areas have multi renewable energy resources. Using single renewable resource, large battery storage system will be required due to their fitful and unpredictable nature. The integration of hybrid renewable energy system with batteries reduces the system variations and economics, in addition to no emissions will be caused by the system. This paper presents a techno economic analysis for six scenarios of a stand-alone hybrid energy system to supply the electrical energy needs for a remote area in Egypt (shalateen city). Shalateen, a remote small city in Egypt locates at latitude (N: 23° 09') and longitude (E: 35° 36') on the Red Sea coast at the southeastern part of the Eastern Desert. Optimal solution was obtained using HOMER software which can supply the demand load for the studied city of 68458.13kWh/day with a peak 6900kW based on the net present cost (NPC) and cost of energy (COE). The proposed hybrid renewable system for the demand load was pv/wind/hydrokinetic/battery, while the other scenarios for the system are pv/battery, wind/battery, pv/wind/battery, pv/hydrokinetic/battery, wind/hydrokinetic/battery. To get the optimal solution using HOMER, solar irradiance, temperature, wind speed, water speed, load profile for the studied city, technical and cost data for all components of the system are required. Data for Solar irradiance, temperature, and wind speed are obtained from SoDa website for one year. Water speed is an assumed data with monthly average value 1.5m/s. load data for one year is obtained from the station of the studied city (Shalateen station consists of a set of diesel generators and pv system). Technical and cost data for the system are presented in the study. Mathematical representation for all components of the system also presented in the paper. From results the optimal solution was the proposed system with 17438 kW PV array, 547 wind turbine with 6.25kW rated power, 9 hydrokinetic turbine with 5kW rated power, 1118 battery with 100kWh rated energy, and 9661 kW converter. The net present cost (NPC) and the cost of energy for the optimal solution were 97.9M$ and 0.307$/kWh respectively. Pv/wind/battery system also gives NPC and COE like the optimal solution, where its NPC is 98M$ and COE is 0.307$/kWh. For single resource systems, pv/battery, and wind/battery, the NPC are 104.6M$ and 130M$ respectively. The cost of single resource system represents a large cost compared to cost of hybrid system. Moreover, the cost of pv system is less than wind system which mean that the solar irradiance is more compared with wind speed in studied location. For two source hybrid systems, pv/wind/battery, pv/hydrokinetic/battery, and wind/ hydrokinetic/battery, the NPC for them are 98M$, 103.5M$ and 129.2M$ respectively. The results show that hybrid system is more economic for remote areas in Egypt compared to single source system. Hybrid renewable energy system is a feasible solution for remote areas in Egypt due to their locations from the electricity grid. In addition to the above it solves the problem of greenhouse gases which are produced from conventional resources which are usually used in these locations.

Keywords- Hybrid energy systems- Isolated areas- HOMER- Egypt

An Analysis of Diabetics Data Using k-Means Clustering Algorithm

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In the medical field, huge data is available, which leads to the need of a powerful data analysis for the extraction of useful information. Several studies have been carried out in the domain of data mining to improve the capability of data analysis on large datasets. Clustering is the important aspect of data mining which is used to analyze much kind of data. It is the process of grouping of data, where the grouping is recognized by finding similarities between data based on their features. There are number of techniques proposed by several developers, they were analyzed the clustering algorithms in data mining. In this research work, the large dataset of diabetics is collected from the reputed hospitals among the specific city. The received information can have the details of person who are affected by diabetics in young age. The Diabetician suggested parameters are only used for the input data in this analysis. For this k-Means algorithm is applied. To evaluate the clustering quality, the distance between two data points are taken for analysis and creation of proper clusters. The result of clustering quality, performance and computer complexity is also analyzed. Highly affected persons are identified through this clustering approach. Finally, the explicit result is generated by using the outcome cluster. The resulted clusters have the details of person who are affected diabetic in young age and specific reason. This type of outcome is used to continue the treatment type or help for the physician or diabetician.

Keywords- Diabetic data analysis; k-Means algorithm; Performance Analysis; Clustering Method;

Information flow in networked system with leaderless structure

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The research on the consensus protocol design has been carried out with leaderless networked system. When a specific node detect exterior information, protocol design followed alone. When the multiple information accessed, node behavior in network system has been investigated. For the nodes in near area shows the similar behavior, but the nodes in the middle of between groups face with challenge to decide. In this research, we provide for the nodes in between groups the measure to make inclusion to specific group. In order to discriminate the group, similarity measure has been proposed with each node characteristics. Successively, the propose measure has been designed based on the similarity measure for each node. Methodology effectiveness has been verified with the simulation under the various consideration.

Biography

Sanghyuk Lee (M'21-SM'21) received Doctorate degree from Seoul National University, Seoul, Korea, in Electrical Engineering in 1998. His main research interests include data evaluation with similarity measure, human signal analysis, high dimensional data analysis, controller design for linear/nonlinear system, and observer design for linear/nonlinear system. Dr. Lee is currently working as an Associate Professor at the Department of Electrical and Electronic Engineering of Xi'an Jiaotong-Liverpool University (XJTLU), Suzhou, China, which he joined in 2011. He has also been working as a founding director of the Centre for Smart Grid and Information Convergence (CeSGIC) in XJTLU since 2014. He has been serving as a Vice President of Korean Convergence Society (KCS) since 2012, and was appointed as an Adjunct Professor at Chiang Mai University, Chiang Mai, Thailand, in 2016. Dr. Lee organized several international conferences with KCS and was awarded multiple honors such as outstanding scholar/best paper award from KCS and Korean Fuzzy Society. Dr. Lee is a senior member of IEEE..

A Conceptual Framework for Smartglass-assisted Interactive Telementoring

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Recent advances in Internet-of-Things and wearable computing have established computationally sufficient infrastructure to remove the barriers of physical locations. The recent COVID-19 pandemic has accelerated the use of remote collaboration, work-from-home, teleconferencing, online education, digital twin, and metaverse enriched with various configurations of augmented reality, virtual reality, mixed reality, and extended reality. In this paper, we propose a conceptual framework for smartglass-assisted interactive telementoring composed of personal tracking, teleconference, and interaction components. More specifically, the roles of three functional components are defined and elaborated.

Keywords- Smartglass, Wearables, Telementoring, Conceptual Framework, Extended Reality

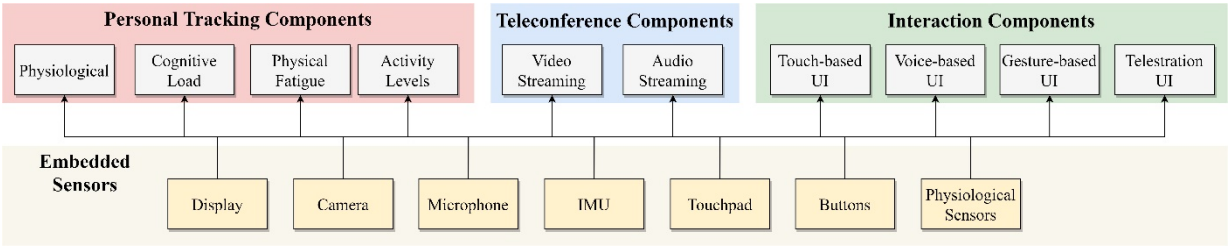

Figure 1. A conceptual framework for SAIT.

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Biography

Hyoseok Yoon is an assistant professor at Hanshin University. His research interests include ubiquitous computing (context-awareness, wearable computing) and Human-Computer Interaction (mobile and wearable UI/UX, MR/AR/VR interaction).

Haneol Oh is an undergraduate student in the Division of Computer Engineering at Hanshin University. In April 2021, she joined the HCI Lab at Hanshin University as an undergraduate researcher.

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Design and Implementation of Self-Instruction Training Application on Wearables

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Instructional contents are used to demonstrate a technical process to teach how to follow certain procedures to carry out a task or use some unfamiliar objects. This type of content is widely used for teaching and lectures in forms of tutorial video and training video. We propose a self-instruction training application on the wearable to utilize instruction videos as well as public open data in creative ways. In self-instruction training, the user's hands need to be free since they are often preoccupied. We design and implement a prototype application to help users train by wearing smartglasses and smartwatches. To increase the efficiency and feasibility of the self-instruction training, we integrate a voice-based user interface and public open data APIs where applicable.

Keywords- Self-instruction, Training, Wearables, Application, Open Data

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BIOGRAPHY

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Using RGB Sensor to Develop a Mini-size Portable Urine Analyzer

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Although kidney disease is underestimated in severity compared to other diseases such as heart disease and stroke, chronic kidney disease (CDK) mortality increased by 14.5% from 1990 to 2017, making it the twelfth leading cause of death due to kidney failure. It is estimated that about 1.4 million people die from complications caused by this. As such, the incidence and mortality of CDK are increasing worldwide, and since it can cause complications and have a fatal effect on life, early diagnosis and prevention of the disease is very important. In general, urinalysis, which is a relatively simple test that is easy to collect for diagnosis, puts less burden on the patient, and is relatively simple, is performed. Urinalysis is classified into physical property test, chemical test, and urine sediment test method, and the double chemical test is used for home urine analyzers in that, unlike physical feature test, quantitative data extraction is possible, and it is cheaper and more accurate than urine sediment test. have. However, in a typical home urine analyzer, the position of a 10-parameter urine dipstick is fixed, and there is a limitation in that it causes a high cost by using an expensive optical sensor. Therefore, in this paper, we developed a motor-based urine analysis system and proposed a low-cost household urine analyzer that can measure 10 parameters of urine with a single optical sensor. And it was designed to be linked with a mobile device through USB serial communication for data storage and processing by analyzing the concentration of metabolites measured through the calibration algorithm in the MCU. As a result of performing a performance experiment using a 10-parameter urine dipstick for diagnosis by implementing the prototype of the proposed device, it showed more than 90% accuracy in the identification of negative and positive first-stage hit rates and abnormal values for each element. Up to now, the average of 10 types of test accuracy was over 80%, proving the high measurement and analysis accuracy of the proposed device.

Fig. 1. Photo of manufactured prototype device of min-size portable urine analyzer.

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Biography

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Development of Skeleton Action Recognition to Secure Human using Artificial Intelligence

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To secure human beings from unaware consciousness based on to improve the efficiency of skeleton action recognition are challenging task in real time. Simultaneously doing multiple tasks, occasionally might possible to creates big issues in their life and also might be bother to others. For examples of scenarios, a person watching smartphone while walking or moving, if their mind is fully focused on inside the smartphone then their might turn on to face any various problems. To overcome with this, to develop new sophisticated system of skeleton action recognition which provides alerts (awareness) of humans and to secure human beings in these community. The proposed method deals with skeleton action recognition based on surveillance camera using OpenPose algorithm. Multi-camera scenario deals with multi-persons such as occlusion, pose variance and action interaction, those are challenging task in real time. In OpenPose algorithm, surveillance camera has taken as input and to produces the output of detecting human action recognition. The procedures of the system is, initially to collect different human pose images, step 2 is preprocessing the data such as scale the coordinates, discard frame if no head or thigh, and filling in the pose of missing joints, step 3 is feature extraction and classification using machine learning algorithm. The following detection accuracy of skeleton action recognition was detailed discussed in result and conclusion.

Keywords- Skeleton Action Recognition, OpenPose Algorithm, Machine Learning Algorithm.

Acknowledgement

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System design of dynamic safety assistant monitoring based on multi-radar for construction heavy vehicles

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Thanks to measures to reduce the number of domestic industrial accidents, the number of accident deaths per 10,000 workers is gradually decreasing. Among various industry domains, the construction industry has the highest portion of 49.9% in accident fatalities. For example, in 2017, the number of fatalities in construction accidents was 971, corresponding to more than half of the total number of industrial accidents.

Unfortunately, as of 2018, the number of accident victims in the construction site is increased by 2%. Construction machinery and equipment provided fatal causes to approximately 16.2% portion of the total number of industrial accidents[1].

Accordingly, there is an increasing demand for an advanced safety assistant device for construction equipment that can prevent accidents in advance by detecting various blind spots at construction sites.

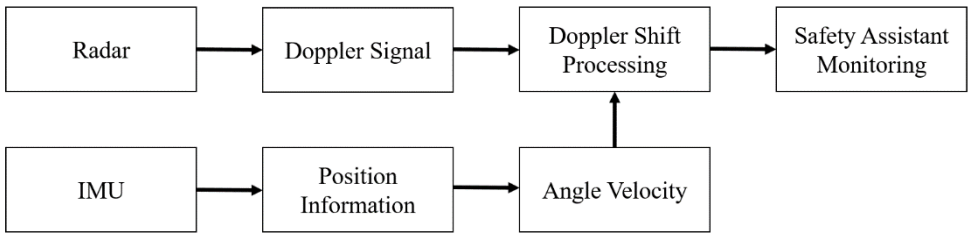

Fig. 1. Signal processing algorithm for IMU and multi-radar based safety assistant monitoring system

Fig. 2. Designed radar module

Various sensors like ultrasonic sensors, RFID, lidar, cameras, and radar are being developed as advanced safety assist devices used in construction equipment. Especially, a radar is very attractive as one of the most competitive sensors because it provides the best and most reliable performance in various adverse conditions at the construction site.

Many researches on a radar based safety monitoring system are made[2,3]. However, it has not yet been reported that the development of a radar-based safety assistant system for construction equipment operating in static as well as dynamic situations. Therefore, in this paper, a multi-radar based safety assistant monitoring system for construction equipment is designed and implemented. In the system design, we must consider how to compensate for the Doppler component due to the movement of the construction equipment to detect only the obstacle of interest with high accuracy. It is difficult to detect the obstacle accurately by the unwanted Doppler component. In other words, the Doppler information caused by the movement of construction vehicles should be removed before detecting targets of interest. To solve this problem, this paper proposes advanced safety assist device based on combining an IMU (Inertial Measurement Unit) and multi-radar[4]. The IMU is utilized to know how tilted the direction of the sensor is. The movement of construction equipment is measured using IMU sensors. In order to remove the Doppler component corresponding to the movement of the construction equipment from the entire Doppler shift, the Doppler component due to the movement of the construction equipment is measured by means of a IMU. Figure 1 shows a block diagram of a signal processing algorithm for IMU and multi-radar based safety assistant monitoring system and Figure 2 shows the designed radar module.

The IMU combined multi-radar can be useful as safety assistant monitoring system for construction heavy vehicles in a moving as well as stationary state.

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Analysis of the vibration environment of freight vehicles

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Batteries have a risk of fire due to vibrations and shocks generated during transportation. In this paper, the vibration history of an actual truck was measured and compared with the existing battery transportation standards. The actual truck vibration was measured by measuring the vibration history along the transportation route using a container equipped with a vibration sensor. Accelerometers were attached to the bottom of the container in the three axial directions to measure the vibration histories for three truck movement paths. In ISO 19453-6, the vibration environment of road vehicles requires the use of a random vibration method. All vibration levels in the trucking section partially exceeded the vibration profile of ISO 19453-6. In conclusion, the transport vibration profile proposed in ISO 19453-6 was 69% on the x-axis, 68% on the y-axis, and 38% on the z-axis compared to the truck vibration profile.

Keywords- Vibration environment; Transportation; Vibration Characteristics

Development of user-customized spinal acupoint medical device through measurement of biometric information

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Acupressure is known to be effective in reducing pain and relieving symptoms in patients with spinal related diseases. A massage bed that provides acupressure or moxibustion functions using acupressure rods does not provide sufficient acupressure and strength control functions for a user's desired area because the position of the acupressure rod is mechanically fixed. To improve this, a bogie with adjustable height was designed and manufactured, and a user-customized spinal acupoint medical device was developed through measurement of biometric information that operates body pressure and pulse analysis in conjunction with the user's biosignals. As a result of measuring the horizontal movement distance and maximum rising width of the acupressure rod in the developed device at an accredited testing institute as shown in Fig. 1, it was confirmed that the horizontal movement range was within ±50.5mm and the rising width was within ±76mm. And the pulse measurement error was within ±2.1BPM, and the weight measurement error was ±4.85kg. In addition, a comparative evaluation of satisfaction between the proposed product and the conventional product was conducted targeting 10 adult men and women. As a result of subjective satisfaction evaluation, the proposed product scored an average of 6.02 points out of 7 points, which was 1.3 points higher than the conventional product. In the future, it is necessary to conduct a study to measure the body pressure distribution in order to confirm the effect more clearly.

Keywords- Acupressure bed, bogie

Fig. 1. A Image during experiment

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Biography

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Image Processing-based Industrial Safety Monitoring System

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Many cutting accidents occur in industrial sites where machines are handled by hand. In this regard, a wide variety of machines are used in the industrial field. In this paper, we would like to deal with a machine similar to a fracture machine typically used in a butcher shop. To this end, we propose an accident prevention system that applies deep learning technology in an embedded system environment based on image processing. An embedded system was implemented by applying the YOLO model, a single object detection algorithm, to Jetson Nano. By using the system to stop the machine before a cutting accident occurs, accidental exposure to the machine could be further reduced.

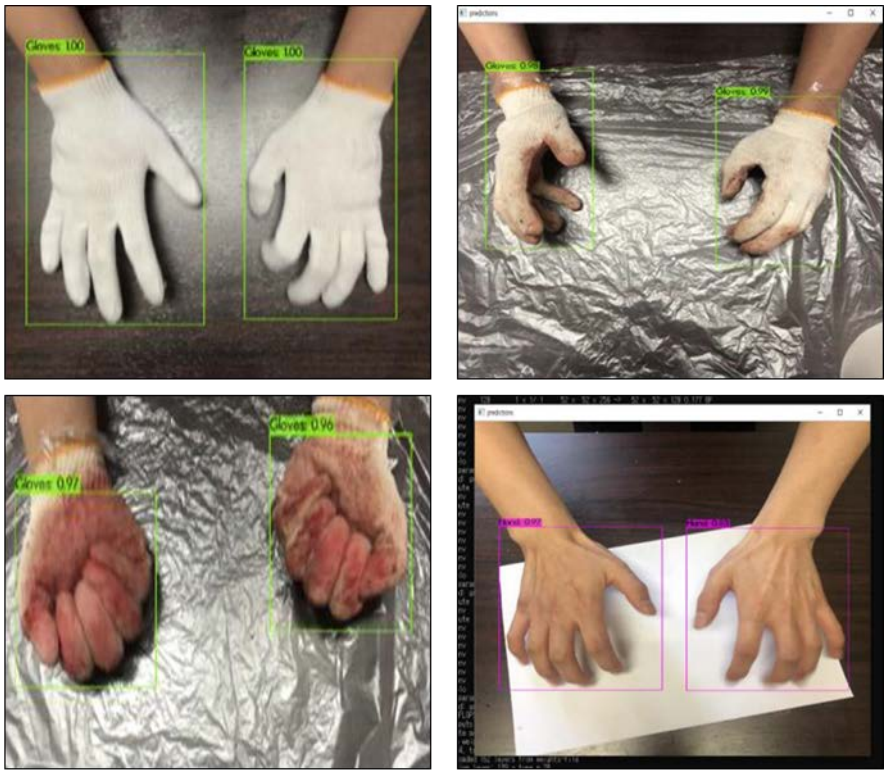

Fig. 1. Detection results

Towards IoT enabled Predictive Agriculture using MicroclimateData

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Since the world population increases 31% by 2050, Food and Agriculture Organization (FAO) estimates that around 70% more production of agricultural products will be required to fulfill the growth of the world population [1–3]. However, achieving the augmentation of food production is even more challenging because of receding water levels, climate change, and decreasing amount of arable land [3].

Agriculture is a time and weather-sensitive domain that is very dependent on the weather of a given place at a particular time. Recently severe climate change has affected agricultural productivity in many countries; hence, the detailed and fine-grained climate with time-based information is essential for future precision farming [4]. This paper presents the services of IoT-enabled predictive agriculture for smart farming shown in Fig. 1.

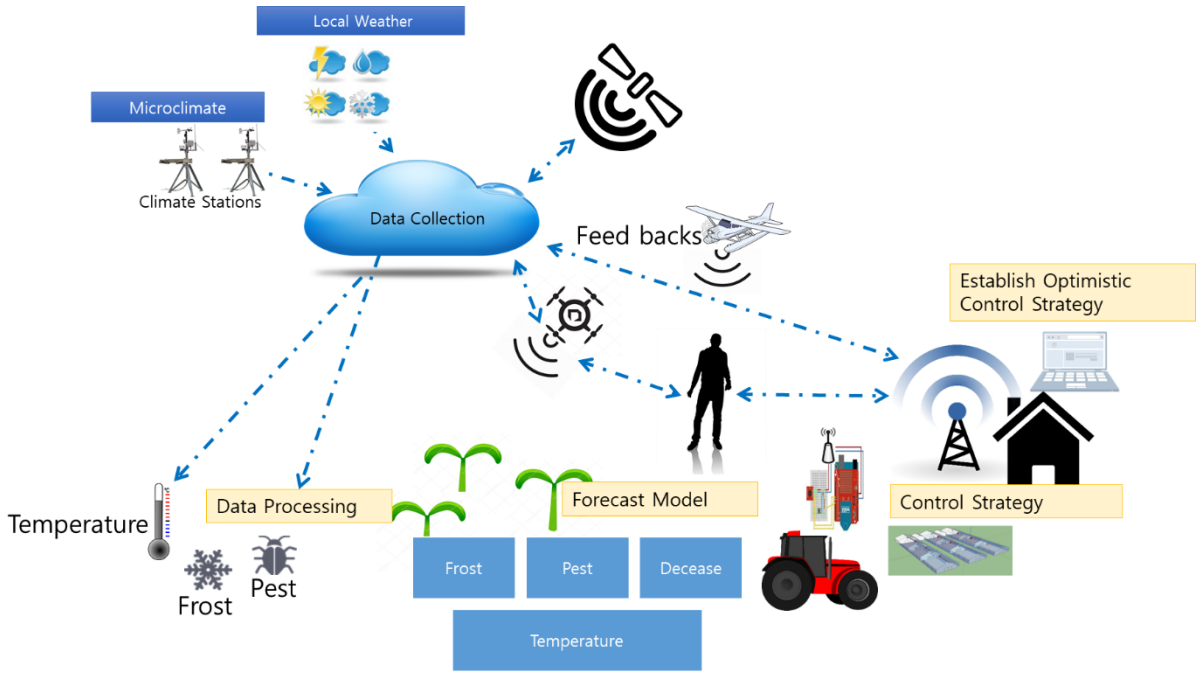

Fig. 1. Overview of Microclimate based Predictive Farming

The system collects fine-grained weather (microclimate), A microclimate is distinctive weather of a small area where the atmospheric conditions such as temperature and humidity are different from those in the surrounding area due to geographical characteristics. There is a noticeable difference between the global or local weather and the microclimate. The microclimate-based prediction can aid in making an automatic decision support system more accurately, to operate the related actuators at the appropriate time [4, 5]. Local weather is collected from KMA (Korea Meteorological Agency), which is needed to forecast pest prediction and stored on a server. Table 1 shows a comparison of the local weather and the microclimate collected at four weather stations between Jan. 1st, 2020 and Dec. 31st, 2020. As we can see, there is a difference between the local and the microclimate from the referenced stations in terms of RMSE (Root Mean Square Error). The RMSEs of temperature is 1.56 in the case of max value per day at station S_1.

Table 1. Temperature Comparison of Microclimate and Local Weather

Station	Latitude	Longitude	$RMSE_{max}$	$RMSE_{min}$
S_1	35.9965213	129.04719	1.56	3.01
S_2	36.0213847	128.974219	1.571	2.621
S_3	36.1082501	128.919287	1.65	2.449

The microclimate-based forecast model consists of the climate prediction model, frost model, and pesticide model. We focus on three microclimate-based agricultural forecast models (Frost forecast model, Pest forecast model, and irrigation forecast model). Tripathyet al.[6] noted the interrelationship of weather, crops, and pests. Crop pests are sensitive to humidity. The frost during the flowering period can harm the blossoms, resulting in significant crop failures [7]. Subscribed users receive accurate frost and pest predictions from the system. Agricultural forecasting using microclimate provides a new insight to allow precise predictions related to time-sensitive agriculture services such as the prevention of frost damage, irrigation, and pest control. Under the development of those predictive services, traditional agriculture depended on human experience can transform into data-driven precision agriculture. To evaluate the forecast model exactly and resolve imbalance problems, we plan to investigate intrinsic properties in the majority of unlabeled datasets. Additionally, microclimate data is increasing, so we will carry out research to improve issues such as data compression in big data.

Acknowledgment

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Development of auto inspection system for Defect Detection of Automotive Rubber Boot

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This paper proposes an automatic defect inspection system for rubber boots, one of the core automobiles parts. Automotive rubber boots are used for the joint parts of the drive system, block foreign substances from the outside and moisture, and prevent lubricants from leaking out [1-3]. Therefore, as automobile performance improves, the importance of rubber boots is increasing. In particular, since rubber boots are applied as protective caps for electric parts and connectors, they are widely used for both internal combustion engine vehicles and electric vehicles. Rubber boots have a steel ring inserted inside to maintain shape, improve airtightness, and increase assembly at the top and bottom of a body made of rubber. In addition to this, automotive rubber boots are manufactured and applied in various ways depending upon the size and shape of the applied structure [4].

In general, automotive rubber boot products are manufactured through a number of unit processes. Several problems, e.g., missing steel-ring insertion, defects caused by double steel-ring insertion, and insufficient weight of rubber boots, could occur in these processes. In the case of the automobile parts process, if each defective product is not sorted in a timely manner, another defective product could be produced in the next process, resulting in significant economic and productivity loss.

In this study, a system was developed that automatically inspects the presence or absence of steel-rings in the automotive rubber boot, excessive insertion, and defective weight of the automotive rubber boot itself using a high-frequency inductive proximity sensor and a load cell sensor. Fig. 1 below shows the driving concept diagram of the inspection system. The designed system was evaluated by randomly supplying 11 normal products, 3 underweight products, 3 uninserted steel-rings, and 3 overlapping steel-rings. A total of 20 product types were tested, and we achieved 100% reliability.

Keywords- Auto inspection system, Automotive Rubber Boot, Defect Detection, high-frequency inductive proximity sensor and a load cell sensor

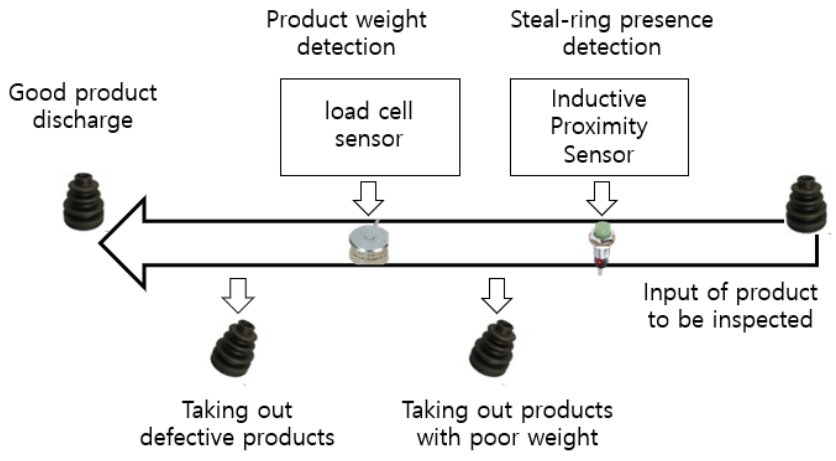

Fig. 1. Conceptual diagram of automated inspection system

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Biography

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Remote Heart Rage Estimation using Differentiable Architecture Search

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Heart rate is an important physiological signal that reflects the physical state of a person and widely applied to medicine, sports, and healthcare applications. Especially, the acquisition of accurate heart rate is useful for the driver drowsiness detection. Heart rate is usually obtained by electrocardiogram (ECG) and photoplethysmography (PPG) that requires commonly contact with a subject's skin which may be inconvenient. Hence, numerous remote photoplethysmography (rPPG) estimation algorithms from face video have been introduced. In early study, most rPPG algorithms used handcrafted features, which achieved low signal-to-noise (SNR) for the dark skin and the age changes of skin. Recently, deep learning based rPPG estimation algorithms has been proposed to overcome these problem [1-3].

In this paper, we introduce a remote heart rate estimation algorithm using differentiable architecture search [4] to automatically search a lightweight network and optimum network architecture for heart rate estimation. To estimate heart rate from face video frames, we firstly detect face bounding box and landmarks from given an input video. Then, we extract face region using face segmentation algorithm. These extracted face region is fed to the proposed network as inputs. To search optimal network architecture, we construct search space, which contains skip connection, maxpool, avgpool, zero operation, 3d conv. block 3d depthise separable convolution, and 3d spatio-temporal block. After the searching stage, the network architecture is fine-tuned on the training set and evaluated on the test set. We implement the proposed network using PyTorch framework in NVIDIA TITAN RTX GPU. The experimental results show that the proposed network achieve even higher accuracy than a complex network while reducing the computational cost.

Keywords- Hear Rate Estimation, Deep learning, Neural Architecture Search, Differentiable Architecture Search

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Biography

Hyunduk Kim was born in Daegu in 1985. He received the B.S. degree in Mathematics from the Kyungpook National University in 2009, and the M.S degrees in applied mathematics from the Kyungpook National University in 2012. He is now an associate researcher in Daegu Gyeongbuk Institute of Science and Technology, joined from 2012.

A practical approach for aspect-level sentiment analysis in the Korean online shopping malls

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Sentiment analysis studies opinion text to identify positive and negative opinions or sentiments expressed in the review text. With the rapid development of online shopping, it becomes increasingly essential to analyze online customer reviews and explore and incorporate them into product design. One of the most challenging online review analyses is the aspect-level sentiment analysis to determine how to connect multiple product features and opinions in one review sentence. We have provided a step-by-step straightforward, but practical approach to addresses the above problem and implemented a sentiment analysis prototype system. We have also gathered and tested the review data set for the Hair Dryer from five Korean online shopping malls, demonstrating that the proposed approach is valid.

Keywords- opinions; product features; hair dryer

Gain Enhancement of Microstrip Patch Array Antenna using Metallic Horn Structure for RADAR Applications

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A method of enhancing gain of a microstrip patch array antenna using a metallic horn structure for RADAR application is presented. A 4 by 1 linear microstrip patch array antenna operating in the frequency range of 24.05 – 24.25 GHz is first designed. A shunt connected series feed network, which has been widely used for commercial RADAR array antennas, is employed in this work. Next, a metallic horn structure is added along the two sides of the antenna in order to increase antenna gain. The effect of the folding angle of the metallic horn structure on the antenna performance, such as radiation patterns and gain, is investigated.

Keywords- gain enhancement, array antenna, metallic horn structure, RADAR

Biography

Junho Yeo received the Bachelor's and Master's degrees in electronics engineering from the Kyungpook National University, Daegu, Korea, in 1992 and 1994, respectively, and the Ph.D. degree in electrical engineering from the Pennsylvania State University, University Park, USA in 2003.

He is currently a Professor in the School of ICT Convergence at Daegu University, Gyeongsan, Republic of Korea. Prior to joining Daegu Univ. in 2007, he was with Radio Frequency Identification (RFID) technology research team at Electronics and Telecommunications Research Institute (ETRI), Daejeon, Republic of Korea as a Senior Researcher working on the development and standardization of RFID Sensor Tag. Prior to working at ETRI, he was a Researcher with the Agency for Defense Development (ADD), Daejeon, Republic of Korea, where he was involved with the development of missile telemetry systems. His research interests include a class of antennas for RADAR, mobile communication, digital terrestrial TV, direction finding, and RFID applications, microwave sensors, chipless RFID, and sensor antennas.

Audio Quality Restoration Method using Convolutional Neural Network

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Artificial intelligence technology, in which computers perform human-like actions or behaviors, is becoming p opular. Particularly, efforts are being made to implement technologies that classify objects or respond to user be havior. It is also attracting attention in fields that require much time and effort, such as restoring paintings draw n in the past. It is expected that it can be used in various fields as well as an image restoration technique using th ree-dimensional data. In particular, audio data has changed from the way of using physical storage devices in the past to the way of being provided on a network basis. In this paper, we propose an algorithm to recover high - q uality audio data from the internal storage device that can be self - produced by receiving compressed audio data. We propose a method of restoring audio data that is arranged and reproduced by changing time-dependent one-dimensional data using lossless audio data and lost audio data after compression through a deep learning technol ogy, CNN (Convolutional Neural Network).

Keywords- Deep Learning, Audio Restoration, CNN

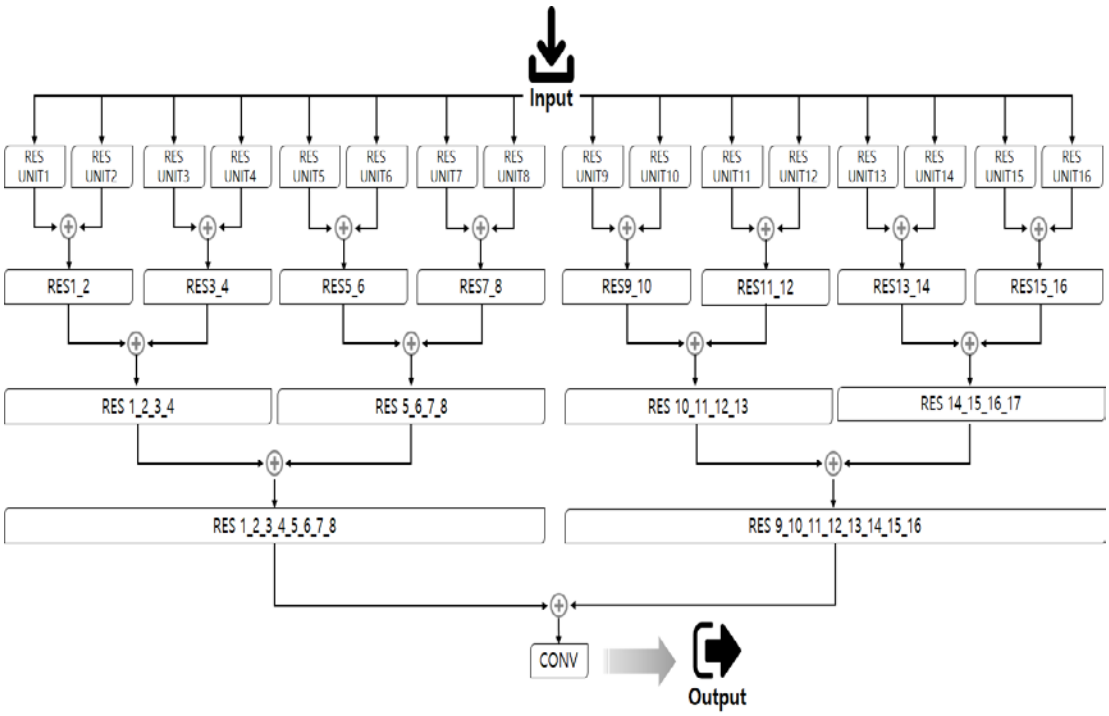

Fig. 1 Proposed Method

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Biography

Hong-Jin Kim received the B.S. and M.S. degrees in Multimedia engineering from Daegu University in 2017 a nd 2019, respectively.

Kyuman Jeong received his B.S. degree in Computer Science from Korea Advanced Institute of Science and T echnology (KAIST) in 1998 and his M.S. and Ph.D. degrees in Computer Science and Engineering from Pohang University of Science and Technology (POSTECH) in 2000 and 2007, respectively. From 2007 to 2009, he wor ked as a senior engineer at the Mobile Communication Division of Samsung Electronics in Suwon, Korea. Curre ntly, he is a professor at Daegu University. His research interests include detail control in NPR (nonphotorealisti c rendering), mobile graphics applications, and computational photography.

Improving the Tonometry Digital Arterial Pulse-Wave Analyzer Performance by Using ICT and Development of Its Healthcare Service

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Increase of cardiovascular disease patients is observed due to the aging population and westernized nutrition. There are many cardiovascular disease monitors developed such as hemodynamic monitoring technology for cardiac skill evaluation. Hemodynamic monitoring performs 3 dimensional.

Pulse imaging test by using blood pressure, blood vessel aging, pulse, cardiac skill evaluation to analyse the blood vessel status. To provide a good health care monitoring service, important data such as cardiac output, pulse information, vascular response information can be measured simultaneously and continuously by using hemodynamic monitoring. Domestic cause of death by cardiovascular disease, High blood pressure, ischemic heart disease, coronary artery disease, arteriosclerosis, arrhythmia, is the second highest. After the COVID-19 pandemic, the correlation between COVID-19 vaccine side effect and cardiovascular disease correlation is under investigation to prevent the severe side effect for underlying disease patients.

Cardiovascular angiography and blood test are considered to be invasive method and electrocardiogram and ultrasounds are considered to be non-invasive method. The aim of this study is to analyze the operating mechanism of DMP-Lifeplus tonometry Digital Arterial Pulse-wave Analyzer, which is the product of Daeyomedi. DMP-Lifeplus is non-invasively measures blood pressure pulse wave by measuring pressure wave. As the demand of non-face-to-face medical and home care service arise, it is necessary to collect and use data during the service. Thus, platform development by using Information and Communication Technologies and cloud computing is studied as well.

Keywords- Tonometry, Cardiovascular disease, Healthcare

Biography

HoJong Chang was born in seoul in 1982. He received the B.E. degree in electrical engineering from the Chnugnam National University in 2006 and M. S. degree in Advanced Device Technology from the University of Science and Technology. He majored in electronic engineering at Chungnam National University in 2014 as a Ph.D.

Introduce Yourself

Since September 2008, he has been a research professor at KAIST Institute for IT Convergence and a team leader of the advanced sensors team. He has worked on more than 20 research projects to date and has produced many deliverables. Based on this, he has more than 30 patents and more than 50 academic papers.

Education and Credentials

He is registered as an advisor and a professional member of several national institutions. In the medical field, he attended meetings as representatives of Korea in Singapore and Germany. He is also an editor for technical standards and an evaluator for assignments.

Notable Achievements

He holds papers in various fields (Electronics, electric, materials, electrochemistry, medical devices, medical engineering, IT, space, circuits, molecular memory, communications, nuclear, radiation, detector, etc.). Based on these achievements, he was listed in the biographical dictionary, such as Dictionary of International Biography and Marquis Who's Who in the World. He also won the Korea vision reader award.

Closing Statement

He will research and to commercialize a read-out electronics for a silicon-based sensor and then create a high performance reac out ICs.

A novel method for precise measurement of Displacement using Eddy currents

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In this paper, a novel method of measuring displacement using eddy currents is presented). The measurement system consists of a sensing coil created on a PCB by patterns, a parallel turning circuit and a microcontroller including a signal processing unit.

When the gap distance between the conductive target and the sensing coil changes, the inductance value of the coil varies by the influence of the eddy current. By detecting the change in the inductance, we have proposed a novel method to precisely measure the displacement of the coil. The sensing range of the implemented measurement system was 2.0 ~ 4.0 mm, the nominal value of the fabricated sensing coil was 11.2uH, and the resonance frequency of the tuning circuit including the sensing coil was 300Khz.

From the experimental results, it is seen there is certain correlation between ADC outputs of the displacement measurement system and the position of the conductive target.

Introduction

Displacement sensors have been used in a various industries[1]. Several types of displacement sensors are being used for different applications such eddy-current type, capacitive type, and optical types, etc[1],[2],[6]. Optical sensors are relatively bulky and expensive[1],[3], while capacitive sensors could achieve high resolution and stability[3], but are very sensitive to environmental changes. On the contrary, eddy-current displacement sensors have several advantages over other types, such as small in volume, robust, low cost, and much less sensitive to the ambient environment from performance perspective.[3],[4],[5]. In eddy current displacement sensors, the displacement of the target is measured by detecting the impedance change of the sensing coil which may vary according to a change in the gap distance between the coil and the target[6],[8].

In this paper, using a tuning circuit and a microcontroller-based signal processing unit, we have proposed a novel system to detect eddy currents for precise measurement of displacement.

In the proposed system, the tuning circuit is driven by a square wave signal from the microcontroller, and the output signal of the turning circuit was monitored by a special circuit detecting the maximum and minimum values in the output signal. These peak values are fed into the microcontroller for further calculation to acquire a correspondent amplitude of a signal from the tuning circuit by performing A/D conversion.

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VENUE

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- **Map & Direction:** 61-13 Odongdo-ro, Sujeong-dong, Yeosu-si, Jeollanam-do

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Daejeon ⇨ Yeosu	**It takes about 2 hours 40 mins from Daejeon City Hall** Daejeon > Iksan JC > Wanju JC > Dongsuncheon IC > Yeosu
Gwangju ⇨ Yeosu	**It takes about 1 hour 20 mins from Gwangju City Hall** Seogwangju > Suncheon IC > Yeosu
Busan ⇨ Yeosu	**It takes about 2 hours 10 mins from Busan City Hall** Busan > Naengjeong JC > Jinju JC > OggoK IC > Yeosu
Mokpo ⇨ Yeosu	**It takes about 1 hour 30 mins from Mokpo City Hall** Mokpo > Jungnim JC > Doryong IC > Yeosu

By Train

Seoul Area ⇨ Yeosu	Yeosu 2 hours 50 mins(KTX)
Daejeon Area ⇨ Yeosu	Yeosu 2 hours 40 mins(ITX)
Jeonju Area ⇨ Yeosu	Yeosu 1 hours 30 mins(KTX)

By Flight

Seoul(GIMPO) ⇨Yeosu	55 mins
Jeju ⇨ Yeosu	45 mins

Yeosu Airport ➢Yeosu Venezia Hotel & Resort

By Local Bus	It takes about 60 mins by local bus (No. 32, 33 and 35) > Get off at “City Bus Terminal” stop Transfer to local bus (No. 333) > Get off at the Exhibition Hall (Hanwha Aquarium) stop
By Airport Limousine Bus	It takes about 40 mins by airport limousine bus. Board the airport limousine bus > Get off at “Lee Soon Shin Square” stop > Transfer to local bus (No. 2) > Get off at the Exhibition Hall (Hanwha Aquarium) stop
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