Multimedia Systems Laboratory

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Refereed academic journal

[jpshin-303-011-01:2016] Woei-Jiunn Tsaur Changqing Gong Liang Zhao Chin-Ling Chen, Jungpil Shin. A SaaS-Model-Based Approach to an Environment Monitoring System. *Journal of Internet Technology*, 18(2):347–359, March 2017.

In recent years, an increasing number of researchers have become involved in wireless sensor networks (WSNs) and cloud computing. However, integrating WSN and cloud computing technology to monitor the environment is still an open issue. In this paper, we propose a WSN and a mobile-device-based environmental monitor based on SaaS (Software as a Service) of cloud computing architecture. In the first scheme, we provide a spare two-tier data aggregation of WSNs which can automatically report event data (such as flood and fire events) to cloud servers. We also use a NS2 simulation tool to implement and prove that our automatic report model will outperform other schemes. The second model is a mobile-device-based event reporting scheme. In an environmental monitoring system since there are some events (such as structural damage to dams and bridges) that cannot be reported automatically, we propose using a mobile device to report such events. The proposed second scheme can defend against Denial of Service (DoS) and man-in-the-middle attacks, achieve mutual authentication, ensure data security and address network security issues.

[jpshin-303-011-02:2016] Cheol Min Kim Jungpil Shin, Ken Maruyama. Signature Verification Based on Inter-Stroke and Intra-Stroke Information. *ACM Applied Computing Review (SIGAPP)*, 17(1):26–34, March 2017.

Signature verification is one of the most popular subjects in pattern recognition. Many kinds of verification methods for on-line handwritten signatures have basically used the individual features of signatures. However, how to reflect inter-stroke information extracted from handwritten multi-stroke signatures in the verification has not been well considered. This paper suggests a new verification method that uses inter-stroke information based on shape contexts. The shape context describes how points are distributed around a given point on the shape. We compare our Shape Context method with a basic method. The basic method performs signature verification using intra-stroke information such as pen position, pen pressure, pen inclination, pen altitude and elapsed time by DP matching. The Shape Context method treats inter-stroke information such as point distribution. In addition, we try to improve the accuracy of the method by incorporating a weighted evaluation of the average pressure value

of each stroke. Comparing with the basic method, the Shape Context method reduces false rejection rate from 4.144.06inter-stroke information on signature verification.

[naru-303-011-01:2016] Masato Nakamura, Takeshi Imamura, Nobuaki Ishii, Takumi Abe, Yasuhiro Kawakatsu, Chikako Hirose, Takehiko Satoh, Makoto Suzuki, Munetaka Ueno, Atsushi Yamazaki, Naomoto Iwagami, Shigeto Watanabe, Makoto Taguchi, Tetsuya Fukuhara, Yukihiro Takahashi, Manabu Yamada, Masataka Imai, Shoko Ohtsuki, Kazunori Uemizu, George L. Hashimoto, Masahiro Takagi, Yoshihisa Matsuda, Kazunori Ogohara, Naoki Sato, Yasumasa Kasaba, Toru Kouyama, Naru Hirata, Ryosuke Nakamura, Yukio Yamamoto, Takeshi Horinouchi, Masaru Yamamoto, Yoshi-Yuki Hayashi, Hiroki Kashimura, Ko-ichiro Sugiyama, Takeshi Sakanoi, Hiroki Ando, Shin-ya Murakami, Takao M. Sato, Seiko Takagi, Kensuke Nakajima, Javier Peralta, Yeon Joo Lee, Junichi Nakatsuka, Tsutomu Ichikawa, Kozaburo Inoue, Tomoaki Toda, Hiroyuki Toyota, Sumitaka Tachikawa, Shinichiro Narita, Tomoko Hayashiyama, Akiko Hasegawa, and Yukio Kamata. AKATSUKI returns to Venus. *Earth, Planets and Space*, 68(1):75, 2016.

AKATSUKI is the Japanese Venus Climate Orbiter that was designed to investigate the climate system of Venus. The orbiter was launched on May 21, 2010, and it reached Venus on December 7, 2010. Thrust was applied by the orbital maneuver engine in an attempt to put AKATSUKI into a westward equatorial orbit around Venus with a 30-h orbital period. However, this operation failed because of a malfunction in the propulsion system. After this failure, the spacecraft orbited the Sun for 5 years. On December 7, 2015, AKATSUKI once again approached Venus and the Venus orbit insertion was successful, whereby a westward equatorial orbit with apoapsis of -440,000 km and orbital period of 14 days was initiated. Now that AKATSUKI's long journey to Venus has ended, it will provide scientific data on the Venusian climate system for two or more years. For the purpose of both decreasing the apoapsis altitude and avoiding a long eclipse during the orbit, a trim maneuver was performed at the first periapsis. The apoapsis altitude is now -360,000 km with a periapsis altitude of 1000-8000 km, and the period is 10 days and 12 h. In this paper, we describe the details of the Venus orbit insertion-revenge 1 (VOI-R1) and the new orbit, the expected scientific information to be obtained at this orbit, and the Venus images captured by the onboard 1-um infrared camera, ultraviolet imager, and long-wave infrared camera 2 h after the successful initiation of the VOI-R1.

Refereed proceedings of an academic conference

[jpshin-303-011-03:2016] Cheol Min Kim Jungpil Shin, Hiromasa Omote. Keyboard Input by Movement of the Finger and Pointer using a Smart Device. In *The 9th International Conference on Advances in Human-oriented and Personalized Mechanisms, Technologies, and Services (CENTRIC 2016)*, pages 29–34, Rome, Italy, May 2016. The International Academy, Research and Industry Association (IARIA), The International Academy, Research and Industry Association (IARIA).

Nowadays, users of smartphones use keyboard input, flick input and multi-tap input. Moreover, there are keyboard input and handwritten character input using a pen tablet for the PC. There is some input methods based on handwriting of characters in the air using Kinect and a web camera in much research. However, character input by using devices such as Kinect and a web camera are limited by the environment. The user also needs to learn a new input method because many systems use the original character input method. We reduce the burden of users by using a smart device with a high penetration rate. Moreover, we use the keyboard input method because it is a general input method. Therefore, users do not need to learn a new input method. Our method can be used by the various environments by using a smart device. Since character input from long distance can be performed using a camera of a smart device moreover, our method can be used broadly.

[jpshin-303-011-04:2016] Cheol Min Kim Jungpil Shin. Character Input System using Fingertip Detection with Kinect Sensor. In John Hallam, editor, *ACM 2016 Research in Adaptive and Convergent Systems (ACM RACS 2016)*, pages 74–79, Odense, Denmark, Oct. 2016. ACM, ACM.

The sign language and the finger alphabet are used for instrumentalizing communication with the deaf and hard of hearing people. Therefore, a character input system using hand gestures has already been extensively investigated. Previous research has recognized sign language, the finger alphabet and hand writing in this regard; however each has some problems. The problems are character recognition time, and a lot of required knowledge about sign language and the finger alphabet. So, many people cannot use sign language or the finger alphabet. The purpose of this paper is to make a character input system that can be used by anyone. This system facilitates communication among hearing-impaired persons and users who cannot use sign language or the finger alphabet without the use of a keyboard, mouse and body-worn computer. This system is a novel approach.

The fingertip is detected by the coordinate of the hand position from the skeleton information. Moreover, the flick input can be performed in the air by using the coordinates of the head, both shoulders, and both hands position. As a result, our system can be used by anyone with only a brief description; further smooth character input is possible using the Kinect sensor and flick input. In addition, the system supports communication not only with Japanese, but also English and numbers. It is expected that our system will enlarge the range of communication.

[jpshin-303-011-05:2016] Cheol Min Kim Jungpil Shin, Ken Maruyama. On-Line Signature Verification Using Inter-Stroke Information. In John Hallam, editor, *ACM 2016 Research in Adaptive and Convergent Systems (ACM RACS 2016)*, pages 80–84, Odense, Denmark, Oct. 2016. ACM, ACM.

Various verification methods for on-line handwritten signatures have been proposed; however, reflecting inter-stroke information in the verification has not been considered. Hence, this paper suggests a verification method that uses Shape Context. In this paper, the verification method is divided into two methods. One is the basic method and the other is the Shape Context method. The basic method treats x-y coordinates, pen-pressure, pen-inclination, altitude and writing time and the Shape Context method treats inter-stroke information as point distribution. Also, the Shape Context method does the verification by incorporating a weighted evaluation of the average pressure value at each stroke. In the comparison experiment, FRR decreases from 4.14from 4.06inter-stroke information method.

[jpshin-303-011-06:2016] Cheol Min Kim Jungpil Shin, Takuya Kutsuoka. Writer Verification Based on Three-dimensional Information using Kinect Sensor. In John Hallam, editor, *ACM 2016 Research in Adaptive and Convergent Systems (ACM RACS 2016)*, pages 89–90, Odense, Denmark, Oct. 2016. ACM, ACM.

The objective of this research is to develop a method to verify who the writer is from his/her figure drawn in three-dimensional space and to reduce the false rejection error rate and the false acceptance error rate. The previous research on writer verification mainly used pen tablets. However, this research used a Kinect Sensor since we expected that the Kinect Sensor could give the useful information of individual features which a pen tablet could not. The verification method calculates the distance between the input figure and the reference figure obtained from pre-processing of the sample data. The distance is compared with the threshold to determine success or failure and the equal error rate is calculated from the false rejection error rate and false acceptance error rate. Twenty-three

examinees drew cubes, cylinders and circular pyramids, which were collected as sample data and test data using the Kinect Sensor. With experimental results, we show that writer verification based on three-dimensional information is very effective.

[jpshin-303-011-07:2016] Jungpil Shin Ryosuke Motoki. Feature Extraction for User Identification using 3D Handwriting. In Jong Yun LEE, editor, *The 4th International Conference for Small and Medium Business*, pages 179–180, Okinawa, Japan, Jan 2016. Korea Convergence Society, Korea Convergence Society.

This paper describes Feature Extraction for User Identification using 3D Handwriting. Pen tablet is often used for signature verification and identification. Pen tablet can get x and y coordinates and pressure, direction, altitude and speed of pen. However, the research using the 3 dimensional-handwriting has not performed. We use the kinect senor or extraction the feature of 3D instead of Pen tablet. Recently, kinect sensor is also mainly used in signature identification, because we can extract four information, that is, x-, y- and z-coordinates, and speeds of drawing. We show the usefulness of Z coordinate information for recognition of 3D Handwriting.

Academic society activities

[jpshin-303-011-08:2016] Jungpil Shin, April 2016.

Program Committee, (held in Venice, Italy, April 24 - 28, 2016)

[jpshin-303-011-09:2016] Jungpil Shin, March 2016.

Program Committee, (held in Orlando, Florida, USA, March 8 - 11, 2016)

[jpshin-303-011-10:2016] Jungpil Shin, Oct. 2016.

Program Committee, (held in Budapest, Hungary, Oct. 9-12, 2016)

[jpshin-303-011-11:2016] Jungpil Shin, June 2016.

Program Committee, (held in San Francisco, USA, June 27-July 2, 2016)

[jpshin-303-011-12:2016] Jungpil Shin, Dec 2016.

Program Committee (held in Los Angeles, California, USA, December 18-20, 2016.)

[jpshin-303-011-13:2016] Jungpil Shin, Sep 2016.

Program Committee (held in Dubai, UAE, Sep. 24-25, 2016.)

[naru-303-011-02:2016] N. Hirata, 2016.

Chair of the committee for information system

[naru-303-011-03:2016] N. Hirata, 2016-2017.

Member of Program Subcommittee, and Editor of Proceedings

Advisor for undergraduate research and graduate research

[jpshin-303-011-14:2016] Kotaro Maruyama. Graduation Thesis: User Authentication using Leap Motion, University of Aizu, Feb 2016.

Thesis Advisor: Jungpil Shin

[jpshin-303-011-15:2016] Sho Akutsu. Graduation Thesis: Personal Cursive Signature Generation System, University of Aizu, Feb 2016.

Thesis Advisor: Jungpil Shin

[jpshin-303-011-16:2016] Chisato Watanabe. Graduation Thesis: Simulating the Light and Shade of the Oriental Brush Based upon Pressure and Z-Coordinate, University of Aizu, Feb 2016.

Thesis Advisor: Jungpil Shin

[jpshin-303-011-17:2016] Yuki Sonobe. Graduation Thesis: Learning System of Writing Kanji of Calligraphy Character using Pen Tablet, University of Aizu, Feb 2016.

Thesis Advisor: Jungpil Shin

Scholarly paper prepared by undergraduate/graduate student(s) you advised

[jpshin-303-011-18:2016] Cheol Min Kim Jungpil Shin, Ken Maruyama. Signature Verification Based on Inter-Stroke and Intra-Stroke Information. *ACM Applied Computing Review (SIGAPP)*, 17(1):26–34, March 2017.

Summary of Achievement

Advisor of a student club or circle

[jpshin-303-011-19:2016] Advisor of EBS Circle

[jpshin-303-011-20:2016] Advisor of fhoto-grafia Circle

Contribution related to the building or operation of the university computer system

[naru-303-011-04:2016] ISTC steering committee

[naru-303-011-05:2016] Working Group for Replacement of the Computer System 1

Contribution related to on-campus/off-campus publicity work

[naru-303-011-06:2016] UoA PR/Web-site Working Group

Contribution related to educational planning management

[jpshin-303-011-21:2016] Member of Patent Committee for University of Aizu

Contribution related to planning administration for research, research conferences, or international research

[jpshin-303-011-22:2016] Advisory Board of Center for Strategy of International Programs(CSIP)

[jpshin-303-011-23:2016] Invited Speaker, Human Computer Interaction and Pattern Recognition, Jungpil Shin, at Jeju National Univ., Korea, Sep. 18, 2016.

Did you participate in Public Lectures, and/or Open Campus? (Yes or No) If yes, please describe what you did.

[jpshin-303-011-24:2016] Presentation of the Demonstration Programs at the Open Campus Festival held at the University of Aizu on Aug. and October 2016

[naru-303-011-07:2016] exhibition in JpGU, 2016.5.22-26

[naru-303-011-08:2016] exhibition in Open Campus of the University of Aizu, 2016.8.11

[naru-303-011-09:2016] lecture in Iwaki Sougou Highschool, Fukushima, 2016.7.13

[naru-303-011-10:2016] lecture in Kaneyama Village, Fukushima, 2016.8.16

[naru-303-011-11:2016] exhibition in Open Campus of the University of Aizu, 2016.10.8-9

[naru-303-011-12:2016] lecture in Aizu-Wakamatsu 4th Junior Highschool, Aizu-Wakamatsu, 2016.10.11

Research achievement that can be used for University-Industry collaboration and its characteristics.(for UBIC's information)

[jpshin-303-011-25:2016] Cursive Style Handwritten Character Synthesis System:1. Synthesizing cursive style characters with probabilistic and natural concatenation between strokes, while not restricting the number of strokes

[jpshin-303-011-26:2016] Kanji Learning System:Verification of educational effect of Kanji learning system for smartphone

[jpshin-303-011-27:2016] Writer Identification System: Enabling low cost writer identification using small number of handwritten character.

[jpshin-303-011-28:2016] Handwriting Recognition Drawn on Screen with Laser-pointer: Enabling the algorithm for Graffiti alphabet character and numeral character recognition.

[jpshin-303-011-29:2016] Simulating Oriental Brush Character Considered With Aerial Action of Pen Tablet: 1.By acquiring the z-coordinate of the pen, more delicate oriental brush characters are able to be expressed. 2.More natural scratchiness, diffusion of the oriental brush are able to be expressed.

[jpshin-303-011-30:2016] User Identification using Leap Motion Controller: 1.We can investigate (1) Inter information among finger joints and (2) Intra information of each finger, e.q. angle of finger joints. 2. The identification rate for 25 persons can be more than 95percent. 3.Goal: A person can be identified only by putting on top of leap motion. Only use the palm of one hand. 4. There is a low risk that we could be lost or stolen. It is used in substitution for a password of the computer.

[jpshin-303-011-31:2016] Character Input System using Fingertip Detection with Kinect Sensor: 1.Able to do quickly input-output of the character. 2.The system can use anyone 3.Increase the method of communication.

[jpshin-303-011-32:2016] Finger Alphabet Recognition for Character Input using Smart Device: This system can be input at a little away distance, because camera of the smart device is recognized fingertips. Users can input characters at a little away location.