Jutta Pääkkönen

EVGA JAPAN CO-OPERATION REPORT

Ochanomizu Research Visit 2014

Centria
AMMATTIKORKEAKOULU

C, Centria tutkimus ja kehitys - forskning och utveckling, 27

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Centria-ammattikorkeakoulu 2015

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Taitto: Centria ammattikorkeakoulu / markkinointi- ja viestintäpalvelut

C, Centria tutkimus ja kehitys - forskning och utveckling, 27
ISBN 978-952-6602-82-0
ISSN 2341-7846

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1. Overview

1.1 University history

Ochanomizu University was established in 1875 as Tokyo Women´s Normal School. It was Japan´s first institute of higher education for women in Ochanomizu (now Yushima, Bunkyo-ku, Tokyo). The school was founded by the national government for the purpose of training female teachers.

Ochanomizu University has educated many talented researchers and educators, including Tetsu Yasui, the president of Tokyo Woman´s Christian University; Kono Yasui, the first Japanese woman to receive a doctorate in science; and Toshiko Yuasa, the internationally renowned physicist.

When all the school's buildings were burned and destroyed during the Great Kanto Earthquake in 1923, the school moved to its current location in Otsuka, Bunkyo-ku in the same year. The lecture hall (Kiindo), main university building, senior high school buildings, and kindergarten buildings are still in use today.

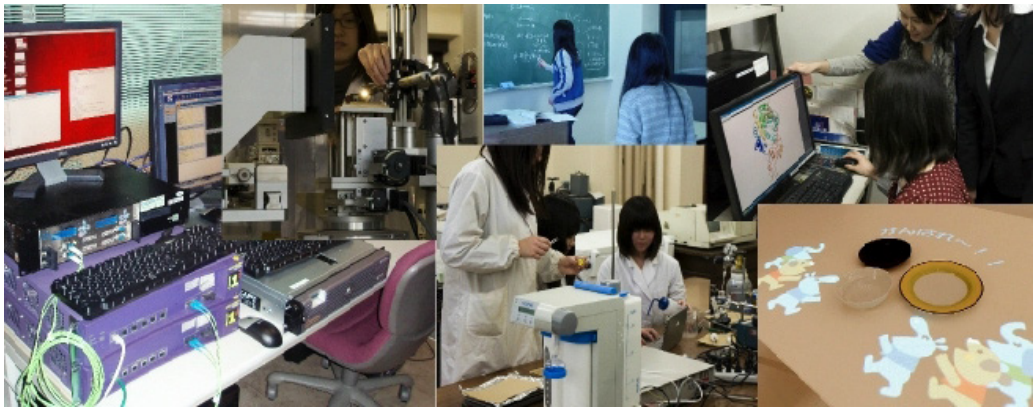
As part of the post-war school reform, the institution became Ochanomizu University, a women´s university in 1949. Under its new configuration, the university established a Faculty of Letters and Education, a Faculty of Science, and a Faculty of Home Economics (now the Faculty of Human Life and Environmental Sciences). A graduate school was founded in 1963, followed by a doctoral program in 1976, as the university expanded and developed its educational and research infrastructure.

1.2 Graduate education

The Graduate School of Humanities and Sciences has pioneered new research fields that go beyond the specialties of humanities and the sciences to foster the creative capacity needed to carry out high-caliber interdisciplinary research. The Graduate School has focused on educating female researchers and has graduated many talented researchers.

The master's and doctoral programs, each with five majors, utilize an instructional system broken down by course and field so that students can attain a high level of expertise in their specialties and attain independent research skills. The graduate programs also offer minor specializations and take advantage of an interdisciplinary instructional system to develop broad research perspectives and multifaceted, cross-disciplinary thought.

The university is considering the implementation of an educational system that integrates the master's program and the doctoral program in order to give talented students a wider perspective and stimulate their creativity, and to create leaders with the ability to perform on the global stage. Accordingly, the university's graduate education plan will include a wide range of education and research projects.



1.3 Promoting gender equality across the university

Ochanomizu University established the Office of Promoting Gender Equality in April 2011 to advocate gender equality as part of the University´s mission as an educational and research institution. In order to represent the entire school, the office is headed by the president of the university and includes all the members of the Education and Research Council. The Office of Promoting Gender Equality has three goals:

1. Improve the institution's educational and research system.
2. Improve the workplace environment.
3. Propose a unique model for the university.

The Office for Leadership Education and Research, headed by the Councilor in charge of gender equality, assumes a central role in carrying out specific programs to achieve these goals. These proactive programs are publicized externally as well as internally and have attracted attention outside Japan.

As one of its most important missions, Ochanomizu University strives to enhance the effectiveness of the plans tailored in the spirit of the Japanese law and entitled "Basic Act for a Gender-Equal Society."

Ochanomizu University houses a kindergarten, elementary school, junior high school, senior high school, university, and graduate school on a single campus. It is also the first national university to have an affiliated nursery school, the Izumi Nursery School, and to offer employee housing within the school. This environment is oriented to women´s lifestyles so they can balance childcare with study, research, education, and work to achieve a work-life equilibrium.

The Center for Leadership Education and Research, which promotes the programs of the Office of Promoting Gender Equality, trains female leaders and promotes diversity. The university is proud of its 140 years of experience in women´s education and the illustrious female leaders it has trained. In 2008, the university founded the "Migakazuba Bible," based on the school song "Migakazuba," which illustrates the principles behind its unique philosophy of leadership education.

Beginning in 2010, the university began to provide support to university researchers and their spouses during pregnancy and after the birth of their children, as well as to researchers caring for or nursing family members so that they could adopt a diverse range of work styles. In 2012, a special research system, unique to the university, was established to support talented female researchers in their ongoing research. The university will continue to provide a place in which women can study and to provide a working environment to give women a work-life balance suitable to the 21st century.

1.4 Cooperation with Centria University of Applied Sciences

The collaboration between Centria University of Applied Sciences and Ochanomizu University has taken place for eight years. Ochanomizu University sends two to three students to Ylivieska each year and Centria has sent its students to Ochanomizu University several times. These exchanges are financed by the Japan Student Services Organization (JASSO).

JASSO provides scholarships to overseas students and to Japanese students who study abroad, implements international exchange programs, improves admission procedures by administering the Examination for Japanese University Admission for International Students, and collects and disseminates information about studying abroad. JASSO strives to provide better programs for the strategic acceptance of overseas students and the development of young Japanese students who will play international roles in the future.

1.5 Presentation of the report

This section of the report describes Ochanomizu University's collaboration with Centria University of Applied Sciences, the objectives of the project, the experts involved, and what the experts accomplished. Also presented are standards, previous research, the goals for the exchange of experts, conclusions, and references.

The researchers' tasks included working on the acoustic measurement system based on iP-rotoxi processors, a technology review about Japanese technology of intelligent traffic, and a user interface design developed for the weather station and the electric vehicle measurement system (NES).

2. Experts

Three Japanese researchers spent two months in Ylivieska working on the EVGA project at the Smarthouse building, arriving at the end of October 2015 and returning to Japan on the 19th of December. Joni Jämsä (M.Sc.) oversaw their research and planned tasks based on the strengths of their resumes. Nao Iizawa's task was to develop an interface design for the weather station and the electric vehicle measurement system (NES), Kaori Ikematsu conducted a technology review of the Japanese technology of intelligent traffic (VICS and other cooperative systems), and Leona Nagafuchi analyzed an acoustic measurement system based on iProtoxi processors.

2.1 Nao Iizawa

Nao Iizawa is an undergraduate student with a major in Information Science. Her areas of study include Human Computer Interface, Programming, Computer Networks, Computer Architecture, Multimedia, Visual Computing, Computer Graphics, Algorithms, Databases, Compilers, Linear Algebra, Infinitesimal Calculus, Mathematical Logic, Probability Theory, Combinatorics, Fourier Analysis, Laplace Transform, and Discrete Mathematics.

Her experience includes:
- Computer Graphics – the creation of a 3-D robot that is able to move in any form and place (Java, OpenGL)
- Database Applications – the ability to search goods in category and price and evaluate the data (SQL, PHP)
- Visual Computing – the creation of a wallpaper using an image-processed photograph (Java)
- Drawing Software – the ability to create simple paintings (Java)
- Website Page – the creation of page to introduce herself (HTML, CSS)
- Game of Racket – the development of a shooting game with a time limit that counts points (Racket)

She is proficient in C, Java, OCaml, FORTRAN, Racket, HTML, CSS, PHP, and SQL. In addition to her fascination with human-computer interfaces, she has an interest in developmental psychology and welfare support for the elderly and handicapped. Her hobbies include Aikido, snowboarding, music, photography, and reading.

2.2 Kaori Ikematsu

Kaori Ikematsu is graduate student and has been a part-time engineer since 2011, working on the development of iOS game applications. Her interests include ubiquitous computing, human- computer interaction, multi-touch interface, objective-C, iOS App development, Python, C++, and PHP. She was awarded a Bachelor of Information Science degree in 2013. Her thesis demonstrated a direct manipulation technique for executing copy-and-paste operations between multi-touch devices. A user can "pick up" a data object displayed on one device screen, "carry" it to another device screen, and "put down" the object on that device using only his or her fingers.

She has been enrolled in the Master of Humanities and Science program since 2013 and her current project is Multi-Press Interaction, which extends touch-based interaction by using pseudo-depression pressure. This technique enables a system to distinguish fingers (e.g., a thumb or a pinkie) or touch pens by the amount of their contact areas and different inputs. In addition

to the conventional touch interface, the multi-press input allows users to switch modes and to input intuitively.

Her publications include:
- Peer-reviewed international conference: "An Intuitive Copy-and-Paste Method between Multi-touch Computers"
- Peer-reviewed domestic conference: "An Intuitive Copy-and-Paste Method for Transferring Data between Multi-touch Computers and Appliances" and "A Multi-touch Technique Using Pseudo-Depression Pressure for Interactive Surfaces"
- Non-peer-reviewed domestic conference: "An Intuitive Copy-and-Paste Technique between Multi-touch Computers"
- Journal (domestic): "An Intuitive Data Transfer Method for Multi-touch Devices"
- Presentation Award 2013: "An Intuitive Copy-and-Paste Method for Transferring Data be tween Multi-touch Computers and Appliances"

2.3 Leona Nagafuchi

Leona Nagafuchi is undergraduate student and interested in improving her skills in different environments. Since April 2011, she has been studying Information Science at the Faculty of Sciences. She studies at Ochanomizu University's Siio Laboratory, and focuses on ubiquitous computing applications and everyday human computing interactions. Her coursework includes Human Computer Interaction, Computer Networks, Visual Computing, Architecture, Algorithms, Linear Algebra, Databases, Probability Theory, Fourier Analyses, Differential Calculus, Integral Calculus, Programming, Mathematical Logic, Combinatorics, and Laplace Transform.

She participated in the Hackathon presented by the Sony Computer Science Lab: GO FOR IT-Home Hacker´s Workshop in 2013, and in the Microsoft Research: International Women's Hackathon 2014 in Japan, a three-day event. Leona made an Android mobile application that can make a film in several directions by using remote cameras. Her team won the top prize in the hackathon with a PC game controlled by Leap Motion. The team members also made video to publicize the game.

Her program language skills include C, C++, Java, FORTRAN, SQL (she created a multi-user web schedule application), HTML, and CSS. Other skills in mobile technologies are Android, iOS, and Titanium. In electronics, she has worked with Stepping/servo motor control by Arduino/Raspberry Pi. Her favorite subject is Mathematics and she won 4th prize in a math contest for all high school students throughout Japan.

3. Standards and Previous Research

The measurement of noise-related standards is the ISO 362-2 standard that measures pass-by noise. The standard defines the requirements for the test track, and the center line may not be within 50 meters of any disturbing buildings, trees, or embankments. The test area must have a width of 15 meters and a length of 20 meters. Microphones are placed at a height of 1.2 meters and 7.5 meters from the center line. The measurement begins 10 meters in front of the microphones and stops 10 meters away from the microphones. The weather station measures temperature, wind velocity, barometric pressure, and relative humidity. In some cases, is also measures wind direction and the track temperature. Each measurement has a specified accuracy. Radar and sensors to start and stop the measurement can be replaced by GPS. [1]

Other standards include ISO 5128-1980, the acoustic measurement of noise inside a car. ISO 13325 is used for the measurement of tire noise, and ISO 11819 measures the traffic noise on road surfaces. [2]

The study was conducted to ascertain how different materials in the car acted to suppress tire noise. The integrating sound level meter 7078 and the Labpro frequency meter were used in the tests. Measurements were carried out at 60, 70, 80, 90, 100, and 120 km/h in the top-gear driving speed. Measuring equipment was placed in the head restraints of the front seats at the height of the vehicle center line. [2]

The external rolling noise research and development project examined the tires and road surfaces produced by the noise and its propagation. The measurements were carried out in various destinations in the xxx metropolitan area, as well as at the Nokian Tyres' testing center and proving grounds. Measurements using Brüel & Kjær sound level meters and microphones, as well as GRASS-manufactured microphones, were taken on DAT recorders and processed later. [2]

The Institute of Occupational Health conducted research to find out the different transport speed of traffic noise frequency distribution. The daily variation of traffic noise was measured by Casella CEL-360 noise-exposure indicators, which recorded the frequency of the A-weighted equivalent, as well as the C-weighted peak sound pressure level every minute for at least 24 hours. Noise levels and frequency analysis were measured by B & K 2260 Investigator resolution with a sound level meter. Sinus SAMURAI software, the Sinus HARMONIE measurement system, and the G.R.A.S. 40 AF-free-field microphone recorded the sound samples. [2]

The Trafi/AKE study examined the position of the vehicles in different countries that had been used in noise measurement methods. The study also examined ways in which noise measurements could be carried out at vehicle inspection centers. Measuring equipment included Brüel & Kjær precision sound level meters 2231 and 2260, DAT recorder Denon DTR 80-P, sound-level calibrator Brüel & Kjær 4231, and a Brüel & Kjær windscreen UA0237. [2]

4. Goals for Exchange of Experts

There were many goals for the exchange of experts, who assisted in mobile programming, user interfaces, and data visualizing. The three students from Japan also had the opportunity to study and work overseas, improve their English, and learn more about scrum-based software development for working, reporting, and testing.

One researcher's goal was to determine how to connect the iProtoxi wireless microphone to the database and install software (Aistin-server) for storing sensor information, which used an air pressure sensor instead of a microphone. Noise measurement systems were also studied through Google and IEEE Xplore. A number of questions were addressed: How should systems be built? What kind of components should they have? Which frequencies are most important when measuring the noise inside a vehicle?

Another researcher's goal was to analyze the research reports below and write a synopsis about them:

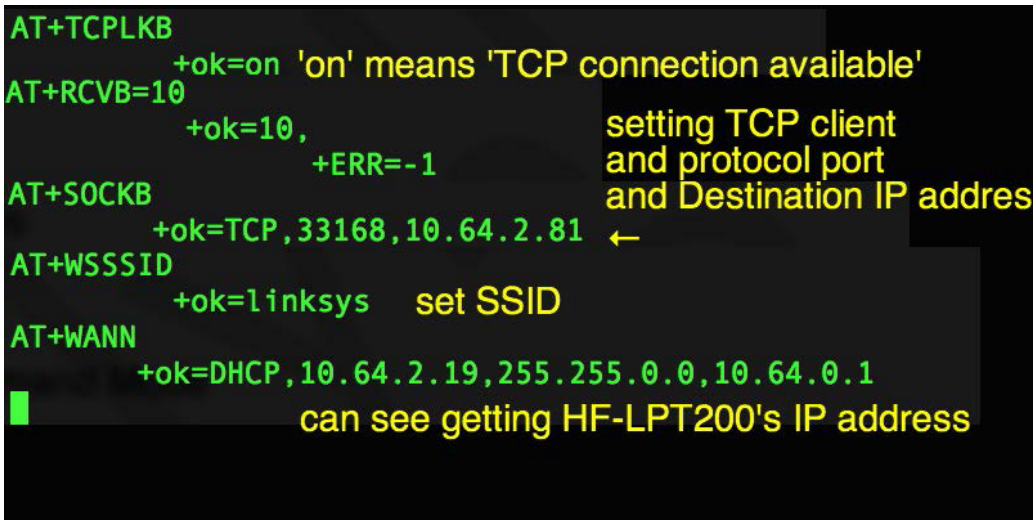
- Chirp Spread Spectrum (CSS) as a positioning/locationing reliability/experience.
- The mobile phone on sensor networks. Can a mobile phone act as a part of sensor network? What is the phone's role as a transceiver/sensor/radio?
- The mobile phone as a data logger. Is it possible to use a phone to store (log) local information (environmental monitoring and noise).
- The mobile phone as a traffic-alerting device. Is it possible to use a phone to deliver an alert message to the driver?
- User recognition on a mobile device, such as PIN/code and fingertip-pattern scanning.
- The need to develop additional traffic standards. Is Finland ready for the standardization of Japan's ITS and VICS? Is there a European system available?
- Personalizing vehicle communication systems to help user interaction with roadside systems. Are there any user experience tests that show if personalization helps interaction?
- The need for better compressions for more efficient communication in low-rate networks.
- Can supplementary information assist drivers in everyday decision making?
- The goal of communication technology is to fulfill the requirements of traffic safety. Is there any proof for it?

The third researcher used user interface design to develop a weather station and an electric vehicle measurement system (NES).

5. Results

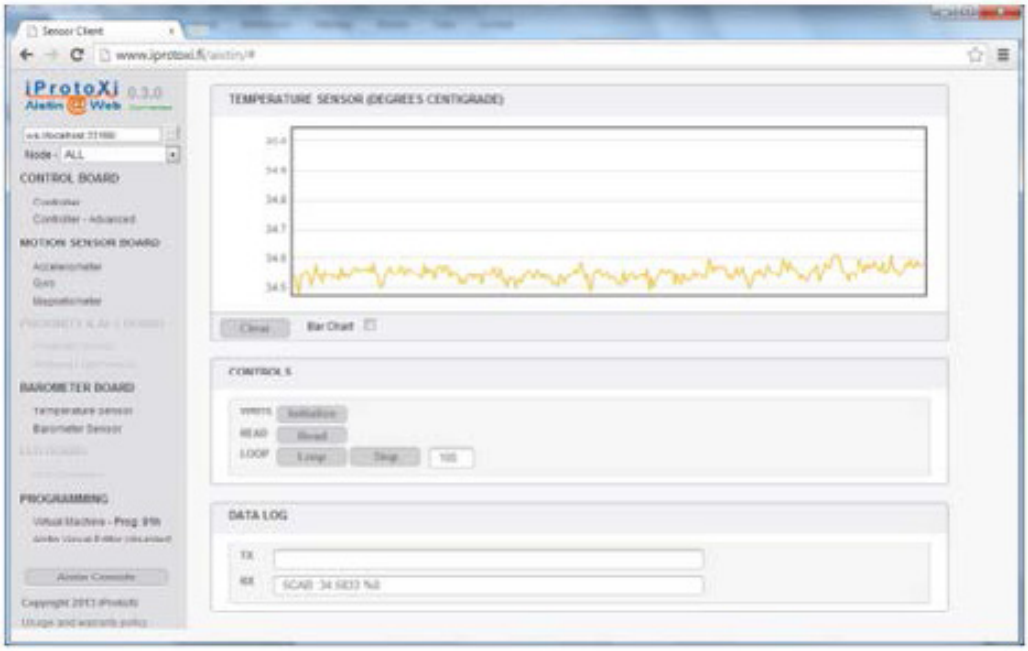
5.1 Acoustic measurement

The expert exchanges resulted in beneficial results. The research showed, for example, that: personal computers have to obtain a static IP address in order to transport data with socket communication; Linksys, which provides Access Point, should be set up to enable SSID and personal computers to connect Linksys and set the static IP address; and iProtoXi has to add the WI-FI module, HF-LPT200, which can connect to Linksys.

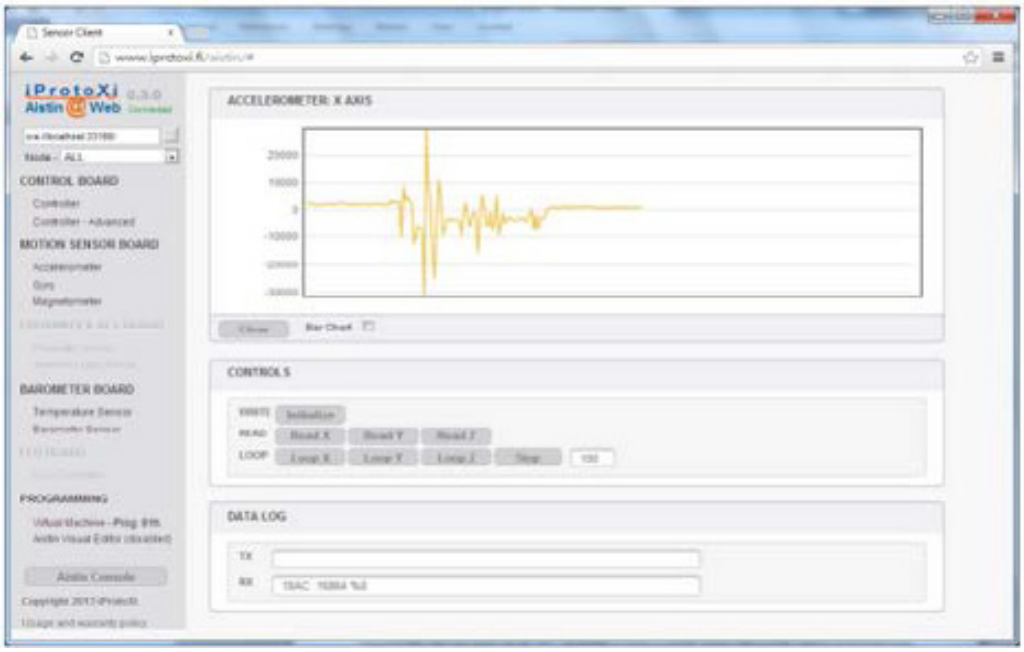


The sensor needed to connect to the CPU and USB-cable needed to connect to the computer. By choosing the sensor, data measurements could be studied. Examples can be seen on the following pages:

Temperature:

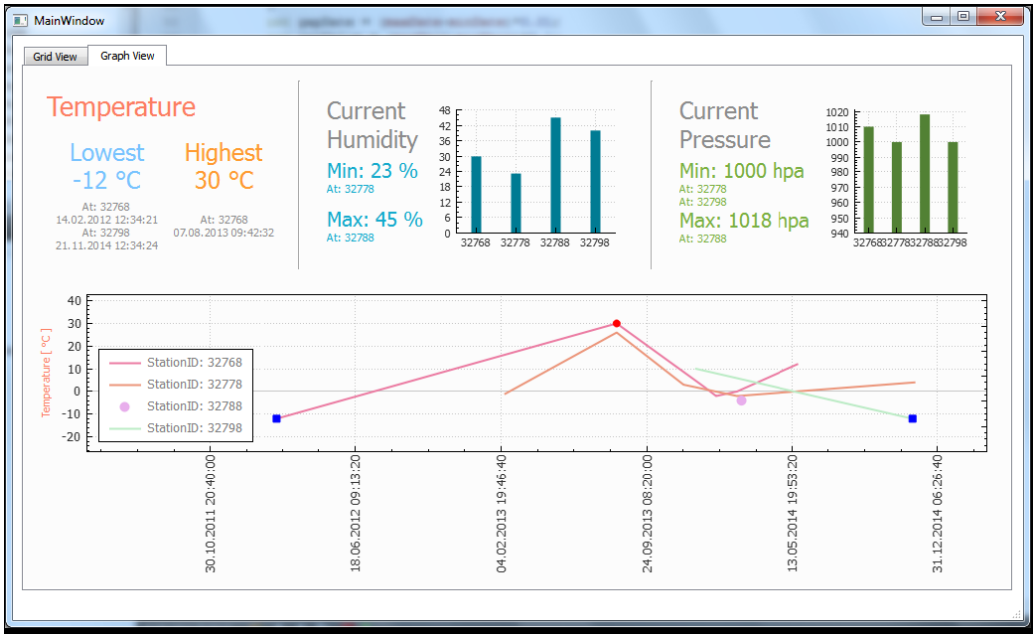


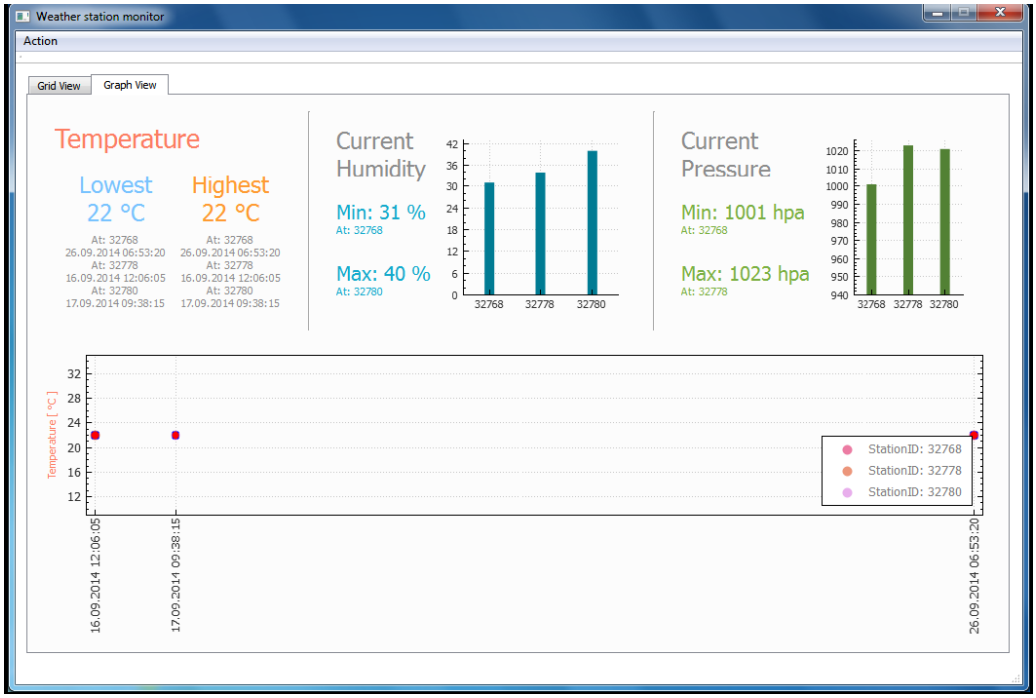
Accelometer:

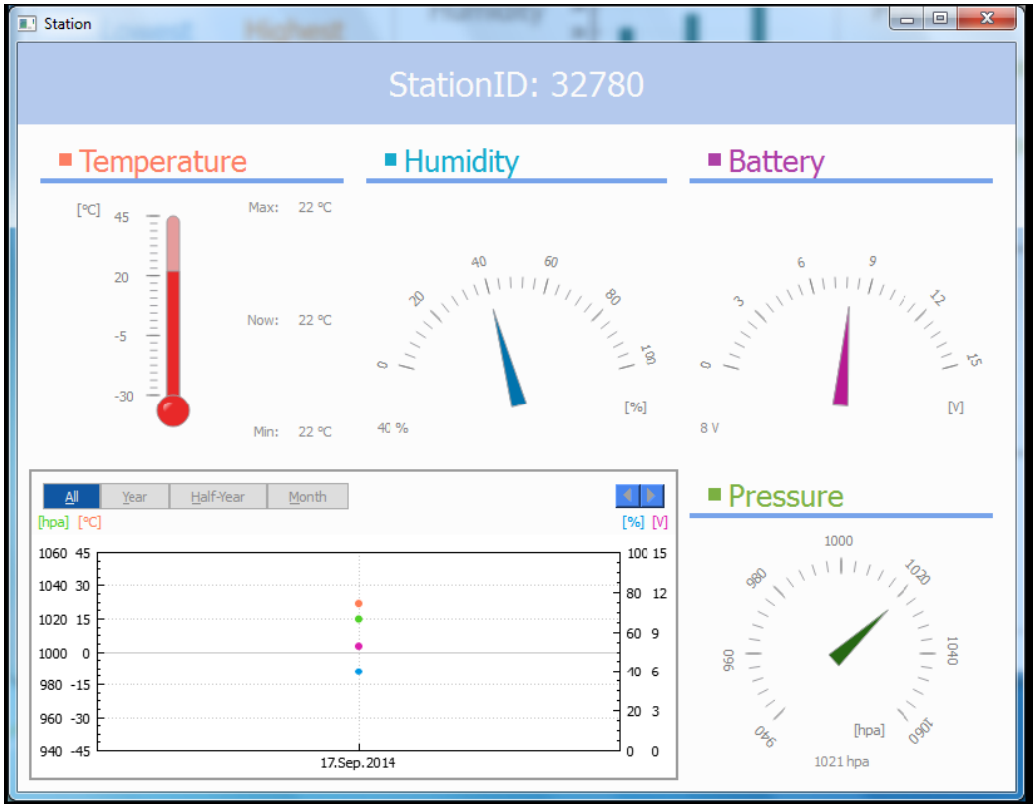


5.2 User interface design

The graphical user interfaces for weather stations look like this:




Weather station monitor
Action
Grid View
Graph View
Temperature
Lowest
22 °C
At: 32768
26.09.2014 06:53:20
At: 32778
16.09.2014 12:06:05
At: 32780
17.09.2014 09:38:15
Highest
22 °C
At: 32768
26.09.2014 06:53:20
At: 32778
16.09.2014 12:06:05
At: 32780
17.09.2014 09:38:15
Current Humidity
Min: 31 %
At: 32768
Max: 40 %
At: 32780
Current Pressure
Min: 1001 hpa
At: 32768
Max: 1023 hpa
At: 32778
32768
32778
32780
Temperature [°C]
StationID: 32768
StationID: 32778
StationID: 32780
16.09.2014 12:06:05
17.09.2014 09:38:15
26.09.2014 06:53:20


Station
StationID: 32780
Temperature
Humidity
Battery
[°C]
Max: 22 °C
Now: 22 °C
Min: 22 °C
[%]
40 %
[V]
8 V
All
Year
Half-Year
Month
[hpa] [°C]
[%] [V]
17.Sep.2014
Pressure
[hpa]
1021 hpa

5.3 Technology review

In her research, Kaori Ikematsu found ongoing work with localization services and the role of the mobile phone in current traffic alerting systems. The research conducted by Hyenwoo and Kim introduces problems with CSS-modulation on location [3].

Sensor networks have been imported into the realm of new technology.Mobile phones can be used to detect sound, motion, and location. Smartphones, with their variety of sensors, have become widespread in recent years. Sensors are used in a variety of ways to gather information about traffic lane. The research of Kamei and Shima demonstrates that Probe traffic information systems, which ascertain road traffic conditions through sensors, gather data about the location and speed of vehicles driven along the roadways [4],[5].

There are many applications for mobile phones users to save local information via social media. Sherchan et al. state that there are two different kinds of use: personal sensing applications and community sensing. The research shows that it is possible and useful to obtain information from mobile phone location data [6],[7].

In Europe, there are so many mobile phones and mobile phone technology fields have evolved so much that, according to Astartia, there are new possibilities for mobile applications. Modern user recognition methods on mobile devices are classified into three categories: non-biometrics, physical-feature biometrics and active-feature biometrics [8]-[10].

For drivers, supplementary information can help to prepare for changing situations and can assist in making decisions quickly [11].

6. Conclusions

The researchers worked hard to carry out their tasks, and their results can be used in future studies. The weather stations graphical user interface can be made on the basis of the results. It can be modified in the future, if it becomes necessary. The iProtoxi modules operate, but the microphone was missing at the time of the study, so additional research is needed.

The researchers said that they enjoyed their stay in Ylivieska because of the friendly people. They found that Centria was a very nice place to work and the people were very skilled. The shortening of the days, however, surprised them greatly. They will encourage their university classmates to apply for the partnership program in the future.

Communicating in English caused misunderstandings at times, but they were easily solved because of the close cooperation in the RFMedia Lab. Working with Finnish researchers improved the visitors' language skills during their stay in Finland.

The relationship between Centria and Ochanomizu University will continue with Prof. Jämsä's visit next summer. His interest is in studying augmented reality for business applications and visual effects to improve the way local small and medium-sized enterprises (SMEs) provide marketing material in Finland.

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Three researchers from Japan worked on the EVGA project during the fall 2014. Joni Jämsä (M.Sc.) planned tasks for them based on the resumes they sent before arriving in Ylivieska. Tasks included mobile programming, user interfaces, and data visualizing. Detailed job descriptions included working on an acoustic measurement system based on iProtoxi processors, performing a technology review about intelligent traffic in Japanese technology, and working on a user interface design developed for the weather station and the electric vehicle measurement system (NES). The research visit lasted eight weeks.

C, Centria tutkimus ja kehitys - forskning och utveckling, 27

ISBN 978-952-6602-82-0

ISSN 2341-7846