The 3rd Summer Program for Innovative Engineering Design

August 16-29, 2015

Kunsan National University

SP!ED 2015

Contents

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Program Overview

The "Summer Program for Innovative Engineering Design (SPIED)" (should be pronounced as "speed") provides a wonderful two-weeks experience for senior college students and master course students from China, Japan, Korea and other Asian countries. This program is mainly intended for the students having engineering knowledge in Mechanical, Electronic, Information Technology fields. In order to aim the practical innovation education the students from other fields such as, Industrial design, Economics, Human Science, Nursing and etc. will be very welcomed to attend. The students from different countries and different fields gather in one place and cross their knowledge and experiences with other participants through international team activities to learn how to create new ideas and products.

SPIED program starts with tutorial lectures by the professors from different universities in different fields to give you food of thoughts and seed for creation. The participant from different countries will be assigned to a team to begin collaborative work with others. We arrange two classes in this summer, the beginner class mainly for senior college students or the first time participants and the advanced class for master course students or ones who have attended last SPIED. In these classes, students can obtain effective innovative engineering training within two weeks. Beyond classroom learning, we also plan several fun events to make good friendship with others coming from different countries.

Spirits of SPIED

✧ *Friendship*
✧ *Coordination*
✧ *Cooperation*
✧ *Mutual Understanding*

Chairman of SPIED: Zhongwei Jiang

Greetings from President

Innovation is always the prime mover in the growth and prosperity of a country. But sustaining the growth and prosperity comes from a constant influx of young minds, thus the improvement of our educational system is also very vital to further develop student's creativity and analytical ability through convergent thinking. This type of thinking is needed in the science and technology field which could pose a challenge to educators to refocus the education system to find ways on how to develop students having convergent thinking.

IDEO is an international design and consulting firm nominated in the most innovative company in the world. The motto of the company is "Innovation begins with an eye." The firm tends to see things differently because it literally sees different things than what focus groups and other conventional forms of market research turn up. The secret of development of creativity is through brainstorming. The ideas become the manufacturing prototypes.

This process is very similar to the Capstone Design system which provides students the opportunities of direct experience about the process from idea to design and build on the basis of acquired knowledge in their lecture.

The Capstone Design Program is growing and evolving to the Industry-University Cooperation courses and workplace education which improve the student's ability of comprehensive design. It is very helpful to solve the problems related technic skills in the work spot, making use of the student's creative ideas.

The program is a course, students conduct a series of work from design, manufacture to presentation for prototypes with various of expertise through getting from their lecture. It is cultivating the student's integrated skills like a creativity, leadership, insights and ability of real world application.

It is no exaggeration to say that creative convergence leads the world in any areas. It is possible to have innovations in every field only with the creative assurance.

The universities of Korea, China and Japan are participating in this Summer Program for Innovative Engineering Design (SPIED) as a joint project. Participating students from three countries will share the process from brainstorming to manufacture prototypes through international collaboration and then they are expected to improve their international communication abilities.

So far, Capstone Design Project has served as an important momentum to change the university education centered on solving the problems in the workplace in the view of the industry. For now, it is expanding the boundaries to the world and expected to contribute to cultivate the creative talents with international competitiveness.

Na Eui Gyun
President
Kunsan National University

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On behalf of Yamaguchi University, I would like to extend my best wishes to you for the informative "Summer Program for Innovative Engineering Design (SPIED)" held at Kunsan National University. I praise those of you who are engaged in this program for your considerable efforts to make this program come alive.

The SPIED is an initiative to provide opportunities for students from Korea, China and Japan to promote a better understanding of international activities and cooperation and increasing awareness about the continuous upskilling by exploring the process of creating and designing based on given themes. Since its first launch in 2013 at Yamaguchi University, the SPIED marks its third anniversary this year. From Yamaguchi University 25 students participated in the 2nd SPIED held at Jiangsu University last year and I have heard that they had productive experiences. As a president of the 1st-SPIED hosting university, I am pleased to know that the program draws a total of more than 70 students this year.

The SPIED makes it possible for its participants to learn not only the mutual expertise but also culture. I fervently hope that all of your commitment to the SPIED and this momentous occasion will lead to strengthen the beneficial relationship among the universities as well as the students and faculty members.

Masaaki Oka
President
Yamaguchi University

On behalf of Jiangsu University, I would like to extend my sincere congratulations to the SPIED 2015 during 16-29 August 2015. It is a great privilege for me to express my heartily celebrations on this event held in Kunsan National University, Korea, and is also a pleasure that seventeen participants from Jiangsu University would attend this event. I do hope that this program will achieve a great success, and all participants will take this opportunity, not only to exchange their prospective ideas and visions for the innovative engineering design, but also a very good platform for the designers from different cultures to understand each other and to promote friendship.

I firmly believe that the SPIED 2015 will be a complete success.

Yuan Shouqi
President
Jiangsu University

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Moments

President of KNU: Na Eui Gyun

President of YU: Masaaki Oka

China

Japan

Korea

Group

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Moments

Moments

Professors

Prof. Chung Taejin, Kunsan Univ, KR

Prof. Jiang Zhongwei, Yamaguchi Univ, JP

Prof. Kim Mi-Hye, Chungbuk Univ, KR

Prof. Kim Youngchul, Kunsan Univ, KR

Prof. Kuremoto Takashi, Yamaguchi Univ. JP

Prof. Lim Jinwoo, DGIST, KR

Prof. Morita Minoru, Yamaguchi Univ. JP

Prof. Nakashima Shota, Yamaguchi Univ. JP

Prof. Pan Tianhong, Jiangsu Univ, CN

Prof. Ra Inho, Kunsan Univ, KR

Prof. Tanaka Toshihiko, Yamaguchi Univ. JP

Prof. Zhu Yi, Jiangsu Univ, CN

Dr. Felipe P. Vista IV, Chonbuk Univ. KR

Ms. Jiang Jabei, Nanjing Univ of the Arts, CN

Teaching Assistants

An Seo Gill, Kunsan Univ, KR

Kim Bae Sung, Kunsan Univ, KR

Kim Jung Un, Kunsan Univ, KR

Kim Seong Ha, Kunsan Univ, KR

Ma Min Ho, Kunsan Univ, KR

No Mi Young, Kunsan Univ, KR

Shin Jong Hyeon, Kunsan Univ, KR

Zhang Hao, Kunsan Univ, KR

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Student List

Beginner Class

Team	Family Name	Given Name	Sex	Major	Email Address	Affiliation
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	You	Seung Woo	Male	Architectural Engineering	kml6205@hanmail.net	Kunsan Univ

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Advanced Class

Team	Family Name	Given Name	Sex	Major	Email Address	Affiliation
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Timetable

Beginner Class Schedule

Date/Time	1 Aug.16(SUN)	2 Aug.17(MON)	3 Aug.18(TUE)	4 Aug.19(WEN)	5 Aug.20(THU)	6 Aug.21(FRI)	7 Aug.22(SAT)
	Check-in	Orientation	Class	Class	Class	Class	City Tour
Morning (9:00-10:20, 10:30-12:00)		Opening ceremony Team assignment (10:00 - 12:00)	Topic1: Electronic Device Design Prof. Vista, Chonbuk Topic 2: Mechanical System Design Prof. Chun	Brain Storming & Innovative Thinking Prof. Jiang, JP	Topic 3: Innovation Applications, System Design, Prof. Chung, KNU Topic 4: Android OS and Smartphone App. Prof. Ra, KNU	Presentations & Discussion	Traditional village City Tour at Gunsan
		IUC(G)	Computer Lab.(B)	Innovation Center	Design Factory	Innovation Center	
Afternoon (13:30-15:10, 15:20-17:00)	Registration	(1) Guidance (2) Preparation (3) Campus Tour	3D Printing Design Prof. Kim, CBNU	Development tools (RoBoRoBo kits) Prof. Kim, KNU	Microcomputer software development Prof. Pan & Zhu, UJS	Reconsidering and re-proposal	
			Compute Lab(B)	Computer Lab(B)	Design Factory	Design Factory	
Evening		Welcome Dinner					Convivial Party

Date/Time	8 Aug.23(SUN)	9 Aug.24(MON)	10 Aug.25(TUE)	11 Aug.26(WEN)	12 Aug.27(THU)	13 Aug.28(FRI)	14 Aug.29(SAT)
	Free Day	Design	Design	Design	Final Evaluation	Tour	Depart
Morning (9:00-10:20, 10:30-12:00)		Teamwork (Brain Storming)	Teamwork (Design)	Teamwork (Testing)	Teamwork (presentation preparing)	Sightseeing Industrial Tour (Saemangeum)	Depart
Afternoon (13:30-15:10, 15:20-17:00)	Free Day	Group Discussion	Teamwork (Creation)	Teamwork (Modification)	Presentation Closing Ceremony		
		Innovation Center	Innovation Center	Innovation Center	Culture Center(18)		
Evening					Farewell Dinner		

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Advance Class Schedule

Date/Time	1 Aug.16(SUN)	2 Aug.17(MON)	3 Aug.18(TUE)	4 Aug.19(WEN)	5 Aug.20(THU)	6 Aug.21(FRI)	7 Aug.22(SAT)
	Check-in	Orientation	Class	Class	Class	Class	City Tour
Morning (9:00-10:20, 10:30-12:00)		Opening ceremony Team assignment (10:00 - 12:00)	3D Printing Design Prof. Kim, CBNU	Topic 1:Industrial Design(Ms. Jiang, CN) Topic 2: Android Programming Technique(Prof. Nakashima, JP)	Brain Storming & Another Thinking Prof. Jiang, JP	Work with the Team (Idea, proposal, etc.)	Traditional village City Tour at Gunsan
		IUC(G)	Computer Lab.(A)	Design Factory	Innovation Center	Design Factory	
Afternoon (13:30-15:10, 15:20-17:00)	Registration	(1) Guidance (2) Preparation (3) Campus Tour	Development Tools (RoBoRoBo kits) Prof. Kim, KNU	Microcomputer Software Development Prof. Pan & Zhu, JSU	Topic 3: Power Electronics System Design (Prof. Tanaka, JP) Topic 4: Patent & Intellectual Property (Prof. Lim, DGIST, KR)	Presentation and Discussion	
			Computer Lab.(A)	Design Factory	Computer Lab.(A)	Innovation Center	
Evening		Welcome Dinner					Convivial Party

Date/Time	8 Aug.23(SUN)	9 Aug.24(MON)	10 Aug.25(TUE)	11 Aug.26(WEN)	12 Aug.27(THU)	13 Aug.28(FRI)	14 Aug.29(SAT)
	Free Day	Design	Design	Design	Final Evaluation	Tour	Depart
Morning (9:00-10:20, 10:30-12:00)		Teamwork (Brain Storming)	Teamwork (Design)	Teamwork (Testing)	Teamwork (presentation preparing)	Sightseeing Industrial Tour (Saemangeum)	Depart
Afternoon (13:30-15:10, 15:20-17:00)	Free Day	Group Discussion	Teamwork (Creation)	Teamwork (Modification)	Presentation Closing Ceremony		
		Design Factory	Design Factory	Design Factory	Culture Center(18)		
Evening					Farewell Dinner		

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Design in Beginner Class

Product Name: Balance Wheelchair

Members:

Chen Yu, Mechanical Eng., UJS, CN

Baek Ju Yeong, Marine Architecture Eng., KNU,
        KR

Kazuhiro Nakamoto, Electrical and Electronic Eng.,
        YU, JP

Do Won, Control Robotics Eng., KNU, KR

Ham Seo Ryeong, Computer Information
        Communication Eng., KNU, KR

ABSTRACT

The aged society is coming, and more and more problems need to be solved. What we are designing is an electric wheelchair with a system which can make the seat maintain balance automatically. It is designed for the elderly and the disabled who may use it on some roads with slope. The shape is almost the same as common wheelchair, but our physical construction is very different. Maybe many chairs now can regulate the height, but none can regulate the angle of the seat automatically and go uphill or downhill in 10 to 15 degrees. We used the motor to drive the screw and make the bracket higher or lower. The power of the electric machinery is 250W. There are two so it's enough for it to go uphill. However, the speed will be limited to 8km/h.

This year in Kunsan National University, we made a model of the wheelchair. First, some parts were printed by the 3D printers and the others were made with different materials. Second, the system was designed by Arduino. We applied Bluetooth to the model, so it could be controlled by cellphone. Last, we used acceleration transducer to know the angle of the slope, then it would regulate it automatically.

PURPOSE

There are so many roads with slope in some areas and it's unsafe for a common wheelchair to go uphill. Also, when they are backward, they will get scared. So we design the wheelchair

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with a seat which can maintain level automatically. It's safe and convenient for the elderly and the disabled.

CONCEPT & IDEA

The design is a wheelchair which can make seat maintain balance automatically through regulating the height of the back wheel.
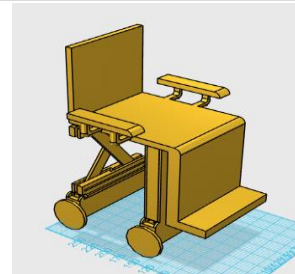
DESIGN & FUNCTION

some parts of our model
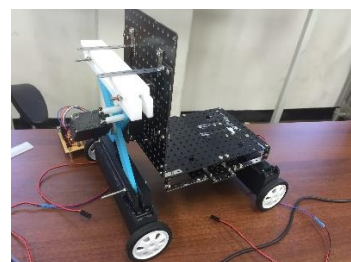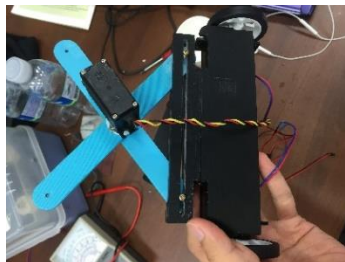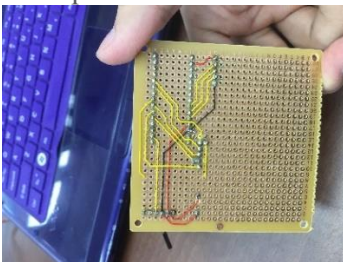
going uphill and downhill
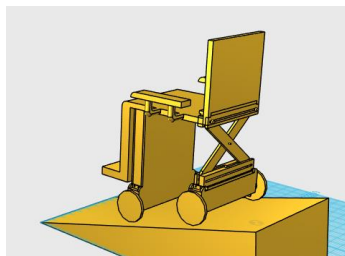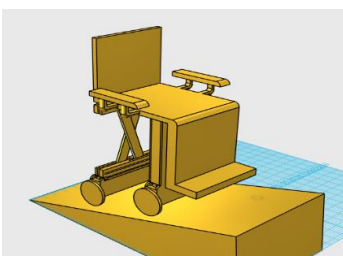
SELF EVALUATION

We have clear division of labor. Chen and Ju Yeong were responsible for the mechanical system, and the three were responsible for the control system. Many times we work hard late into the night. We think it's very good for us to know each other and do the program together. It will be precious experience in our life.

Product Name: Spied Stick

Team Members:

Dong Hyeong Lee, Mechanical Eng., JBNU, KR

In Je Baeg, Architectural Eng., KNU, KR

Jitosho Hisao, Mechanical Eng., YU, JP

Young Hoon Seol, Robot Control Eng., KNU, KR

Ju Li Han, Computer Eng., KNU, KR

Jiang Tao, Electrical Eng., UJS, CN

ABSTRACT

With population growth becoming a serious problem in our society, it is very important to take care of those old people. Spied Stick is designed especially for old or disabled people who cannot walk very well. It is different from normal sticks mainly from three aspects: white light, emergency button and umbrella-transformation:

-When walking in a dark environment, just click the light button to turn on the light, stick will shine white and help you see your way clearly and ensure your security especially for those old people who cannot see very well.

- And when users fall down on the ground, just by clicking the emergency button, the light on Spied stick will turn red and make a loud sound to let people around you know your situation and come to give you a hand. At the same time, Spied Stick will also call the ambulance.

-The umbrella-transformation can help you not get wet when suddenly rains, and it can also solve the trouble for stick-users not to bring a stick and an umbrella together every time.

PURPOSE

Spied Stick is designed to help users walk stably and fastly so that ensure users' life security and live a convenient life.

CONCEPT & IDEA

Red is the emergency button.

Yellow is the light button.

Blue groove is the place to put one 9V battery.

The LED light is under the grip.

The body of this stick contains an umbrella inside.

DESIGN & FUNCTION

White LED light can help users find their way easily and also reduce the probability of old people falling down in a dark environment. The emergency button will help users get help in time from other people around and hospitals. The umbrella-transformation will help you avoid being caught wet by sudden rains.

SELF EVALUATION

* SPIED (speed, popular, infinite, easy, design) Stick *

Spied Stick can help old or disabled people walk stably and fastly. When facing emergency situation, easily clicking the emergency button will help you get help from people around or hospital in time. What's more, the umbrella-transformation can help you not get wet when suddenly rains. In the future, added GPS function will let users' other family members know your position all the time.

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Product Name: Smart Spoon

Members:

Shi Bao Yu, Measure And Control., JSU, CN

Kashibe Naoto, Mechanical Eng., YU, JP

Yang Byeong Min, Computer Eng., KSU, KR

Koo Dae Hwan, Control Robotics Eng., KSU, KR

Han Bo Ryeong, Materials Science Eng., KSU, KR

ABSTRACT

Nowadays, the disabled people are still increasing every year. Some of them can't eat food or drink water by themselves, such as stroke and hemiplegia patients, and sometimes they can't feel the temperature of food or water, if they drink too hot or cold water, it will cause other disease. It is noteworthy that the rehabilitation training is an effective method for treatment of hemiplegia and stroke patients.

So we make a smart spoon aimed for the hand of rehabilitation training of hemiplegia patients, which is detachable. The patients can set a appropriate grip to train their hand, if their grip is enough, and A red indicator will light up, on the contrary, the green one will light up. In addition, we use LCD to display water's temperature and hand's grip. When water's temperature is proper to drink, the buzzer will sound. This function can prevent patient from being burned.

PURPOSE

This product aims at helping hemiplegia patients train their hand which is good for treatment of hemiplegia, at the same time, its additional function will supply more convenience for them.

CONCEPT & IDEA

This spoon can be separated from the grip for washable, which is made of metal material. The patient of hemiplegia can measure hand's power and set grip. In addition to this, we add one function in order to remind patients appropriate temperature with sensor and buzzer.

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DESIGN & FUNCTION

1、Overall design:
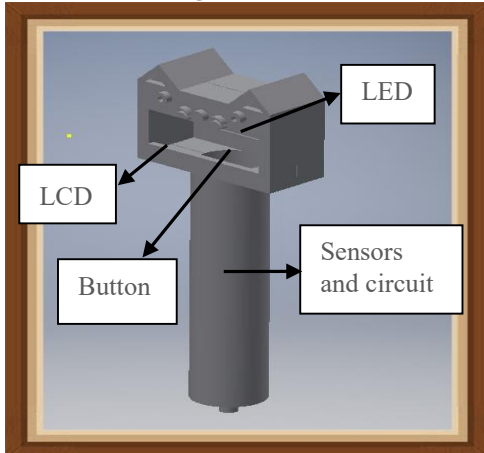
2、Physical wiring diagram
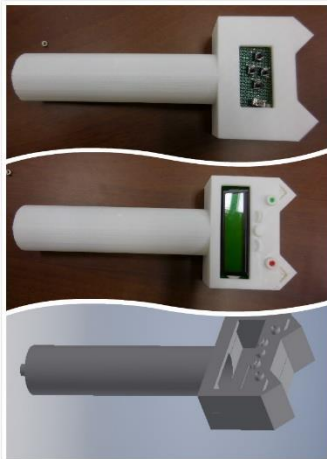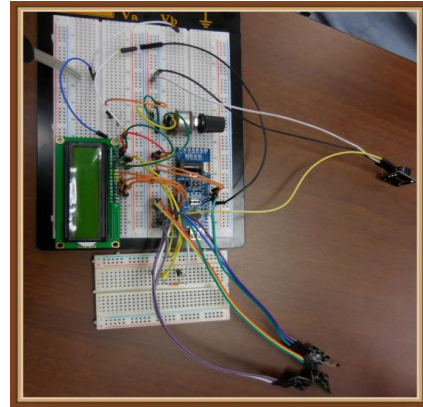
Function:

Display users' hand power, compare with grip which is settled in advance by users. Its purpose is to help hemiplegia for rehabilitation. Measure water and food's temperature, and display it with LCD, when the food or water's temperature is proper to eat and drink, it will remind the users.

SELF EVALUATION

Our teammates come from three different countries, at the beginning, it is quite difficult to communicate with each other. Our idea was changed two times, all of us were very upset during that time, but we thought the idea on time with our commitment and teachers 'support. During our design time, we have a clear assignment of responsibilities and duties, all of us enjoy the process although we still have many problem in design. This is a memorable moment in our life.

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Product Name: Sole Cleaner

Members:

Sato yosiyatsu, Mechanical Eng., YU, JP

Lee sun woo, Computer information communication Eng., KNU, KR

Wang Jinshan, Mechanical Eng., UJS, CN

Moriyooshi Yudai, ,YU,JP

Yoon Min sung, Architecture Eng, KNU, KR

ABSTRACT

Nowadays, the increase of people are used to entering into their house room the time they open the door, due to the fast life style and habit. Because of this, they will take plenty of small stones and mud into their rooms and soil the floor, especially at suburb areas or in rainy days, so that they would waste many time and energy to clean their floor later. Based on this current situation, we put forward our product-the sole cleaner.

The shape of our product is like a box and people can stand on it. When people back home, open their doors, they just need to stand on it for a while before they enter. The device starts work the moment people stand on the top floor and stops the second people leave. There is a brush and fans under the top floor. The brush can clean the soles, remove little stones and mud, and the fans provide strong power to draw these garbage into the box.

The majority of our product is made of wood. We print the floor, box, fans with the 3D printer. The other structure is constructed by ROBOROBO and we make program by Arduino.

PURPOSE

We put forward this product in order to clean the soles of feet automatically before people enter into their house to give them a neat and tidy living environment.

CONCEPT & IDEA

We use a sensor behind the top floor which can test whether there is a person stand on it. When people stand it will give signals so that the brush and fans can work.
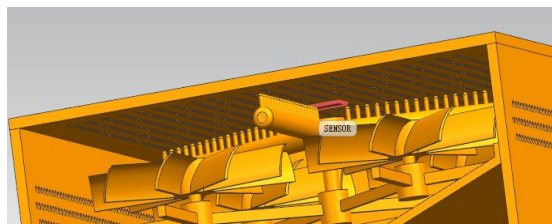
DESIGN & FUNCTION

1. This device is mostly made of wood and the top floor, garbage box, fans are made of plastic.
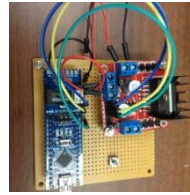
2. We use Arduino to make program and control.
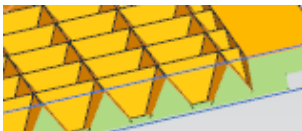
3. The top floor consists of many triangle, so stones can't stay.

4. There is a brush and a fan under the top floor.

5. Gradient walls on the sides to let the rubbish fell into box.
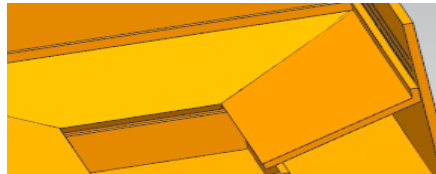
6. Garbage box collects rubbish.

7. The fan that we printed.

SELF EVALUATION

Our product is not too expensive, even very cheap. And it can clean timely and efficiently than traditional blankets. The product function is very simple and it would make some noise perhaps but it can solve real problem, saving time for you.

Our members separate the whole work to like this: Wang was responsible for producing mode, and Yoon used 3D printer. Sato assembled the product, Lee programmed Arduino program, and Yudai made an electric circuit. We divided this big task into small to exert everyone's advantage. We all feel happy and full to take part in this activity.

SP!ED 2015

Product Name: Moving Doeramon which can spit out food

Members:

Ishida Takehito, Mechanical Eng., Yu, JP

Hori Ko, Mechanical Eng., Yu, JP

An Byeong Jin, Science of software, CU, KR

Jeong Byoung Woo, Computer information Communication Eng., KNU, KR

You Seung Woo, Architectural Eng., KUN, KR

Wu Ting, Laboratory Medicine, UJS, CH

ABSTRACT

Aged society is coming, the proportion of people who are older than 65 has reached 10% among Japan, Korea and China. When children leave them, pets can increase the enjoyment of their life as their best friends. However, most old people are unable to move freely. So they can't play with their pet easily. In order to make the interaction more interesting, we design this pet toy to promote the relationship between old people and pets.

Considering the limited mobility of old people, this product has a Bluetooth module, so that old people can use an android application to control the pet toy. The pet toy can move, light and make some sounds to attract pets' attention. What's more, when users operate with the application, some dog food will drop out from the pet toy to feed the pet. The mechanical structure of this product is constructed by ROBOROBO which can move in different directions and have a caterpillar belt to transmit dog food. The program is made by Arduino. To make the appearance more interesting, we use 3D printing technology to print a Doreamon outer shell.

PURPOSE

We design this pet toy in order to help old people play with their pets more easily and promote the interaction between old people and pets.

CONCEPT & IDEA

This design is a toy car with the appearance of Doreamon, which can be controlled by Bluetooth. Old people can use an android application to make the toy car move, light, make sounds and feed the pet.
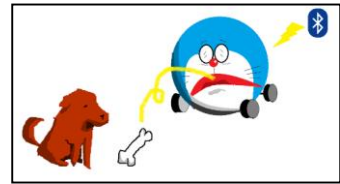
DESIGN & FUNCTION

1. Hardware
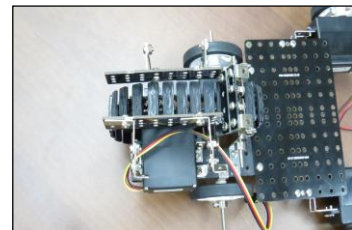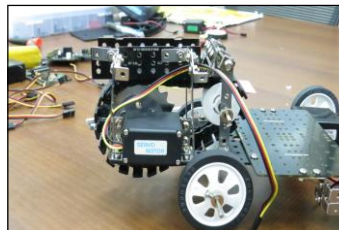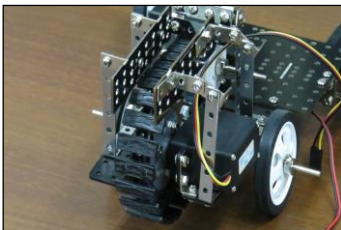
2. Software
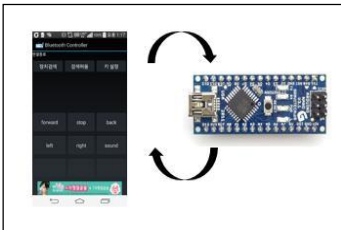
3. Function

1. Click the button on the wireless controller.

2. This operates the conveyor inside our products.

3. The conveyor is then exported to feed.

SELF EVALUATION

It was the first time to interact with foreigners for most of our team members. It seems difficult to solve aging society in this situation. However, we had made an interesting work with the advantage of the respective areas of expertise. Of course, it is not perfect that we made. This product aims at making relation between aging people and their pets better, but it needs additional function to make them happy. Probably, we could not do own best because of language problem. So, if we get a chance to make again, we'll study language and want to do own best.

Product Name: The Multifunctional Wheelchairs

Members:

Zhang WenTao, Mechanical Eng., UJS, CN

Sambommatsu Masataka, Mechanical Eng., YU, JP

Won Seung Hwan, Info & Tele, KNU, KR

Kim Hoi Keun, Electronic Eng, KNU, KR

Jang Yu Ri, Industry Design, KNU, KR

ABSTRACT

Nowadays, the aging society is coming, which means the old people need to be paid more attention. And here comes the problem. Lots of senior citizens, who are inconvenient to walk, want to have a breath of fresh air in the park with their wheelchairs. But many parks have sidesteps without special road for wheelchairs. So it's difficult to go inside of the park. In this case, we deign a type of multifunctional wheelchairs, which can use electric energy instead of physical strength to move as well as to go up the sidesteps. As a product designed for the elderly people, users can control the chair by the buttons, which is easy to operate. What's more, our chairs have some other humanized functions like lamp and trumpet. As a model to demonstrate, we use the ROBOROBO and sensors to construct the mechanical structure. Meanwhile, we use Arduino to make the program and use mobile phone to control through Bluetooth.

PURPOSE

We design this type of multifunctional wheelchair in order to help those old people with wheelchairs to visit the park without special road and to make the elder people's life more convenient.

CONCEPT & IDEA
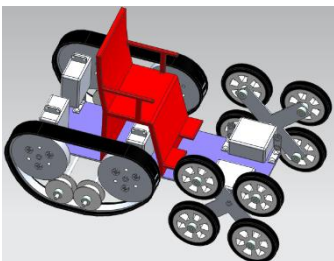
The multifunctional wheelchair move forward or backward by the caterpillar band and go up the sidesteps by the planet wheel.

SP!ED 2015

DESIGN & FUNCTION

1.Design

The whole construction is made by ROBOROBO and use the Arduino to control.
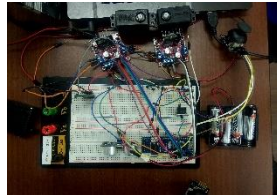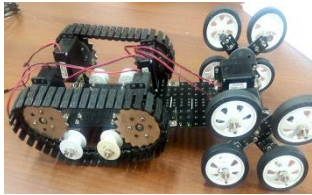
The planet wheel has two movements. Four wheels could turn free respectively and rotate as a whole.
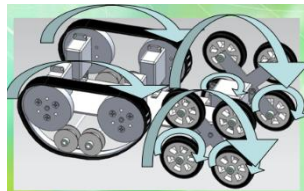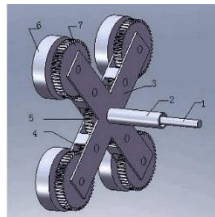
2.Function

A. Go up sidesteps B. Use electric to drive C. Lamp and trumpet D. Emergency stop button
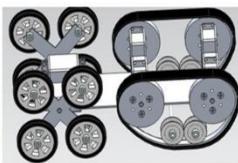
SELF EVALUATION

   Compared with the current wheelchairs, the multifunctional wheelchair can take the old people to visit somewhere that don't have special road. Also, it can use electric energy and buttons to operate.

   But there are still existing some drawbacks, which need to be improved. For example, the chair need remain steady when it goes up sidesteps. Meanwhile, its safety should also be tested before it come into producing.

   During the 2 weeks' design and manufacture, every member of the team throw themselves into work actively. Not only do we divide the work based on specialization but also we cooperate with each other. So, we are an excellent team.

Product Name: Helping Carry

Members:

In taek Lee, Material Eng, KNU, KR

Young Ju Lee, Mechanical Eng, CBNU, KR

Tatebatake Kenichi, Mechanical Eng, YU, JP

Miyamoto Reo, Mechanical Eng, YU, JP

Hyun Jae Lee, Electronic Eng, KNU, KR

ABSTRACT

- Development for the aged

- Development for society

- Development which can be realized

PURPOSE

Older people do not have power. So it is not easy for Older people to using the stair.
Our team's purpose is to help older people when they use the stair.

CONCEPT & IDEA
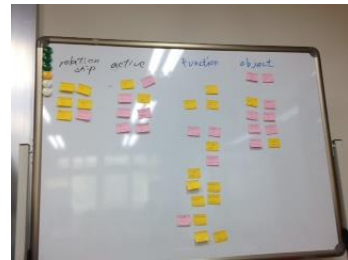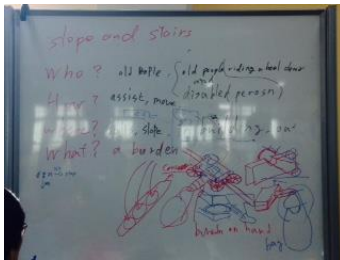
DESIGN & FUNCTION
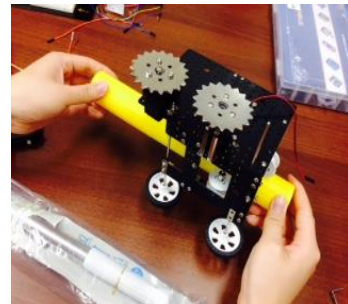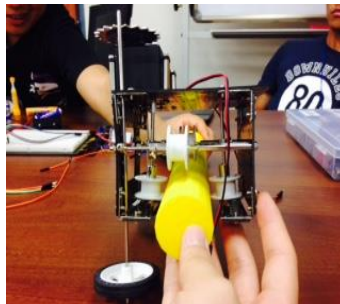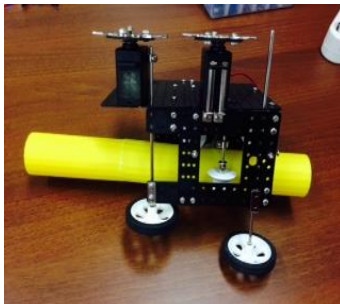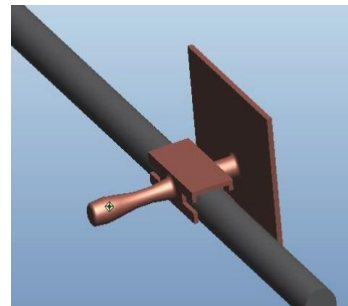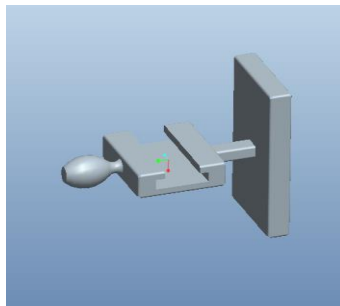
SELF EVALUATION

- The production cost of the machine **was not much.**

- Currently, the machine does not stand for a large weight

But if we improve **the quality to our** machine**,** we can apply the machine to real stair.

SP!ED 2015

Design Advance Class

Product Name: FBI (Friend of Bath Innovation)

Members:

Jeong Beom Gyun, Mechanical and Automotive Eng., KNU, KR

Mu Dan, Mechanical Eng., JSU, CN

Shim Cheol, Computer Eng., CBNU, KR

So Seok Jin, Industrial Design, KNU, KR

TAGAWA TOMOKI, Electrical and Information Systems Eng., YU, JP

ABSTRACT

In Japan, a lot of old people like to take a bath in bathtub at home. But because of the lack of sensibility to temperature and pain, the elderly often be burned by the hot water. In addition, the elderly cannot notice the red and swollen skin burned and then it often causes some accidents in the end. Therefore, the purpose of our device is to protect old people against scald happened in bathtub. The LCD panel can show messages to old people, such as water temperature and bath time. The bathtub cover can prevent old people entering into the water with unsuitable temperature.

PURPOSE

The purpose of our device is to protect old person against scald happened in bathtub, which is the first cause of death in the elderly at home in Japan, and improve the current products.

CONCEPT & IDEA

Our device is composed of the following sections:

Detecting system (temperature and ultrasonic sensor);

Power system (batteries, DC motor and DC motor driver);

Drive system (gear and axle);

Executive system (bathtub cover and LCD panel);

Operating control system (Arduino and push button);

Supporting system (bread board, cover box, bathtub and bathroom).

SP!ED 2015
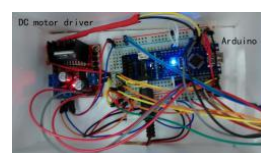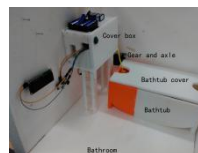
DESIGN & FUNCTION
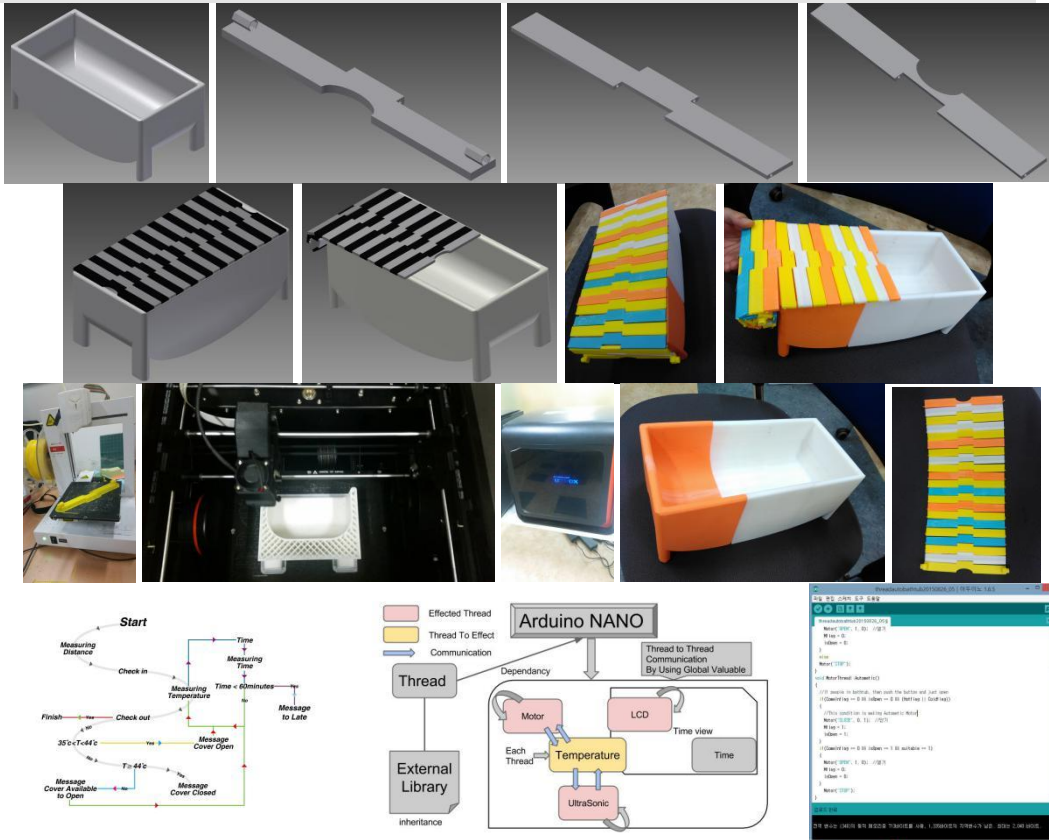
If the water temperature is not in the suitable range (30~45°C), the bathtub cover will be closed and the old person cannot enter into the bathtub. On the contrary, when the water temperature returns back to the suitable range, the bathtub cover can be opened and the old person can take a comfortable bath safety.
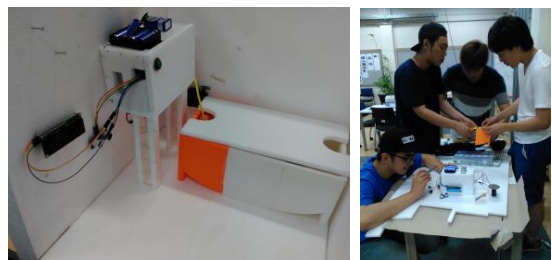
SELF EVALUATION

Advantage:

1. Friendly human-machine interaction

2. Cheap

3. Easy to equip

Disadvantage:

1. Application limitation

2. Cannot control the water in and out automatic

3. Lack of power

SP!ED 2015

Product Name: Gold Car

Members:

CheolMin Kim, Material Eng., KNU, KR

DongKyu Shin, Mechanical Eng., KNU, KR

SeonJoo Choi, Compuer Eng., CBNU, KR

Handa Yuya, Yamaguchi Eng., YU, JP

Shen ZhengNan, Vehicle Eng., JSU, CN

ABSTRACT

Currently, Asia has progressed aging. Old people have many problem .For example, they degrade power and physical fitness. So, I searched in the market about 'Supplies for silvers' for elder's comfortable life in movement. First of all, raise current silver car's problem. We think about solution of them. Then, the important things are 'safe' and 'easy to use'. So, we chose these two concept. We try to make silver car that have five function. And we name it to 'Gold Car'. Next, we collect our idea about Gold car. We explain each of functions. We put on pictures of each of parts. Finally, we state about 'Gold car's evaluation' each other.

PURPOSE

Asia is the place that is currently growing elder population. Seniors are struggling to move freely because of the aging of body parts. We searched in the market about 'Supplies for silvers' for elder's comfortable life in movement. As a result, we found that there is a product named 'Silver Car' that has difficulties to use in the stairs. The elders who has week force has difficulty at uphill. So we had to implement additional features to consider 'safe' and 'easy to use' for these problems.

CONCEPT & IDEA
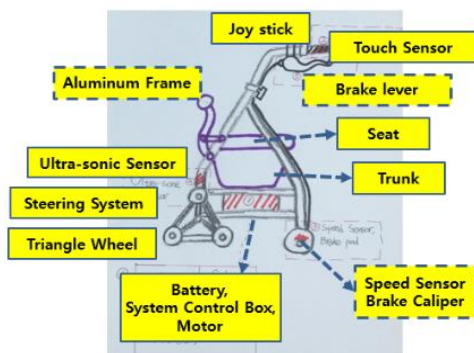
Elders who has problem in joint need to help when they walk. That's why our team consider the concepts of 'Gold car'. Our major concepts are Safety for user & Easy to use.

Our Ideas are concentrated on the situations that users could be experienced. 1st When elders want to climb the uphill, Motors could be helpful. 2nd

When elders walk down the downhill, Speed sensor limits the maximum speed of wheels. 3rd When elders hand off the handle in downhill, Touch sensor will give signals to Brake caliper then 'Gold car' will stop itself. 4th When gold car meets obstacles, ultra-sensor will realize it and notify for user by beeping. 5th When Gold car meet a step, Triangle wheels that attached on front side can take over the step.

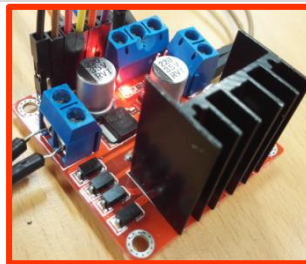These are our ideas for solving problems that elders can be experienced.

DESIGN & FUNCTION
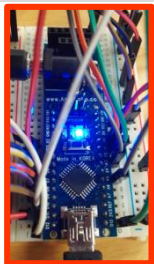
Miro-controller

For decision
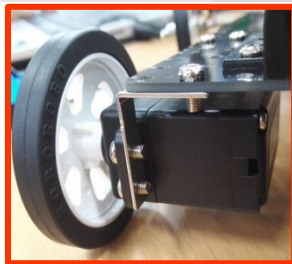
DC Motor

Give motive power

Motor Drive

Control motor

Battery

Provide power
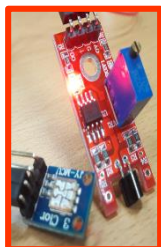
Touch Sensor

Recognize hand off
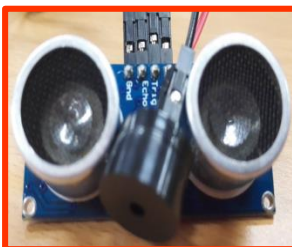
Ultrasonic Sensor

For warning
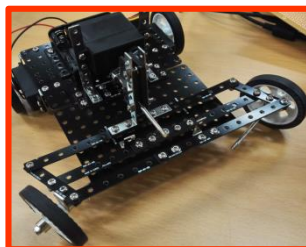
Steering Mechanism

Turn right or left

Joystick

Change direction

SELF EVALUATION

Gold car is able to be adapted to quite various environments. It could be convenient in real life. But we think that Arduino-Nano provides low power (V3.3). That's why our hardwires of product work weekly. And two or three functions can't work at the same time. And our Gold car need to prepare about rainy day situations (Water proof system). Finally if we make a real size, it needs to be more lighten.

SP!ED 2015

Product Name: R. Porter

Members:

Yun YeoSeon, Computer Eng., CBNU, KR

Kim HakGeun, Mechanical Eng., KNU, KR

Jeong MinYeong, Material Eng., KNU, KR

Liu Wei, Mechanical Eng., UJS, CN

Itagaki Naoto, Mechanical Eng., YU, JP

ABSTRACT

With the public aging aggravating continually, old people themselves now have to take care of home, go shopping, and so on. It's hard for them to take heavy things when they go up and down stairs. So we design an automatic system to solve this problem. This automatic system is mainly used in residential buildings or public places where do not have elevators or escalators. This system is moving continually, and its speed can be controlled. When old people go up and down stairs with heavy things, they only need to attach their luggage to the hook, then the luggage can be transported up and down automatically. Meanwhile, the luggage can be taken away easily at any time. In case some old people may not catch up their luggage, the system will be stopped automatically (using ultrasonic sensors) when the luggage arrived in the end. Then the LED and buzzer are switching on, and the system will be alarmed until the luggage is taken away. In the end, by calculating, we have chosen the motor and gear which satisfy the frictional force and load torque. And the safety of this automatic system has also been proved.
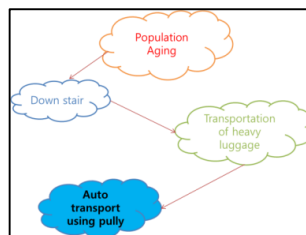
PURPOSE

This designed automatic system is used to help old people carrying things when they go up and down stairs. It's very convenient and effective to operate it.
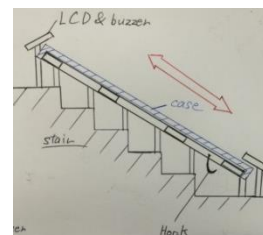
CONCEPT & IDEA

It's hard for old people to take heavy things when they go up and down stairs. So we design an automatic system to solve this problem.

Go up and down stairs with things

Mind map


sketch of idea

SP!ED 2015

DESIGN & FUNCTION

Design: Using two DC motors and other components (gear, chain, case, etc.) to drive the system. The system moving continually, and can be stopped automatically.
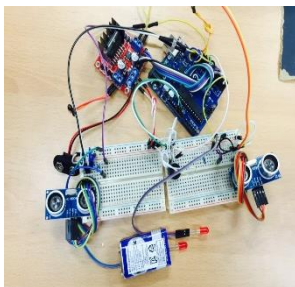
Function : The user attach a load to the hook and wait until LED and buzzer switching on, then the system will alarm. And they can also take away the load at any time.
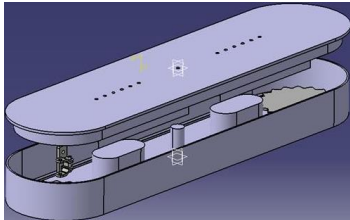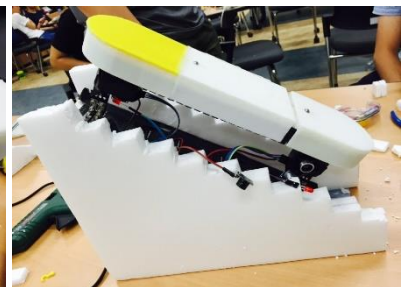

Assembly model
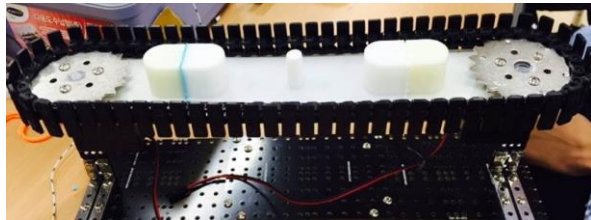
system without case

Circuit using Arduino

system with case

final model

SELF EVALUATION

This automatic system is very convenient, cheap and effective. It is mainly used in residential buildings or public places where do not have elevators or escalators. It can be used to help old people carrying things when they go up and down stairs. Old people can attach their luggage to the hook easily and take away the luggage at any time. And meanwhile, the system can be stopped automatically (using ultrasonic sensors).

This product is the result of our team work. We are working together, thinking and talking all the time. We all benefit a lot from the design process. It will be our life's wealth. In the end, we want to say thank you to all the professors. Thanks for your advice and comments.

SP!ED 2015

Product Name: Anywhere Reach Wheel Chair

Members:

Kim Wi Jun, Electronica Eng., CHU, KR

Kang Soo Min, Mechanical Eng., KNU, KR

Kim Young Ah, Industrial Design, KNU, KR

Nakamura Nobuya, Mechanical Eng, YU, JP

Chen Ye, Electronic Eng, UJS, CN

ABSTRACT

The world faced with the problem of aging population. Korea, Japan and China is also in the situation. The old people with leg problems have lots of trouble in their daily life and they may need someone's help. As you know that most of the home appliances and facilities are made for normal people. It is uncomfortable for old disabled people to grab the stuff they want. So we think if wheelchair can move up and down, he can reach things of higher position. Old people can't put out the strong force. So it can move only pushing button.

This product use Arduino as the control system and the motor drive is linked to the Arduino. In addition the Arduino connect to the mobile phone using the Bluetooth. So the old disabled people can just using the mobile phone to make the wheel chair forward, backward, up and down.

PURPOSE

The main purpose of our product is making the old disabled people to reach things of higher position.

CONCEPT & IDEA

In this product we want to use the mobile phone to control the chair. So we choose the Bluetooth to connect to the Arduino, then the Arduino linked to the motor driver. Finally, we reach the purpose making the wheel chair go anywhere.
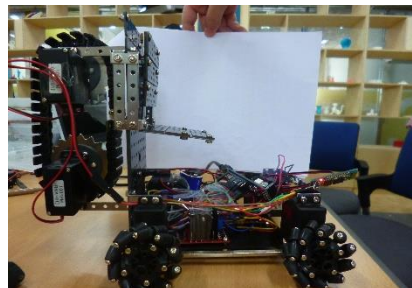
DESIGN & FUNCTION

Photo1: This is the Arduino which control the motor driver to make the chair up, down, forward and backward. In addition, with the Bluetooth the Arduino can receive the command from the mobile phone.

Photo2: This is the Bluetooth which do help with the mobile and Arduino connection.

Photo3: This is the motor driver receive the command making the chair move.

Photo4: This is the caterpillar make the chair up and down

Photo5: This is the smart phone control, it sends data to the Arduino through Bluetooth.
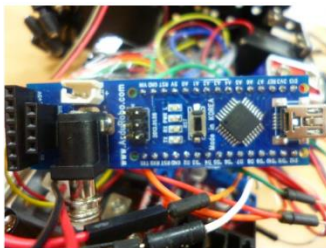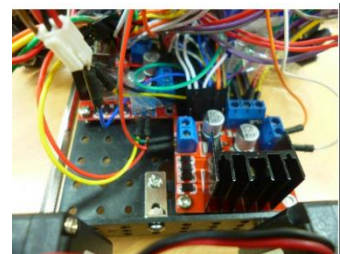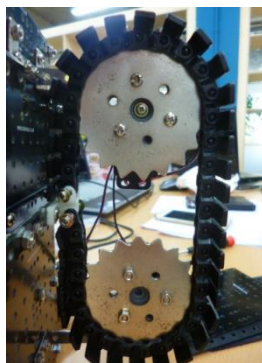
Photo1.

Photo2.

Photo3.

Photo4.

Photo5.

SELF EVALUATION

The product we have made has the advantage of lift the old disable people. Furthermore, it can control the wheel chair from the smart phone. And as you know that mechanism wheel is connected with our wheelchair for wanting wheelchair move 8 directions, but it is too difficult to balance of the weight of the wheelchair. And if we could solve this problem, the wheelchair can be moved more easily in small space.

SP!ED 2015

Product Name: Nice Care

Members:

Cai Lei, Control Eng., UJS, CN

Sakura Wataru, Mechanical Eng., YU, JP

So Kyeong Yong, Mechanical Eng., JBNU, KR

Choi Jong Hyun, Mechanical Eng., KNU, KR

Choi Mi Ri, Computer Eng., CBNU, KR

ABSTRACT

There are many older people who have knee pain, backache and poor sight in the world. They need an assistant product to help walking. So, we invented the Nice Care Stick. It has a variety of functions. One is Chair function. While most of older people are walking, they need to take a rest because they have knee pain and backache. The function helps them. Furthermore, When they are at home, they spend time watching TV. The function that is remote control helps to control TV without moving. The last function is LED. LED is included in the product. It is easy to walk for older people when they walk at night.

PURPOSE

The rate of older people is 30% now and it increase fast. Especially, the people who have knee pain is most of older people and the rate is around 70% among patients. Thus, older people need assistant products and there is wheelchair, stick, and so on. The purpose of our product is that it is help to walk and it is easy to live at home for older people.

CONCEPT & IDEA

The lower part is impressed by camera tripod and we get the idea from the fishing chair for the chair part. This principle is the three point suspension. The LED is designed by ADUINO program.

DESIGN & FUNCTION

<Design>

<Function>
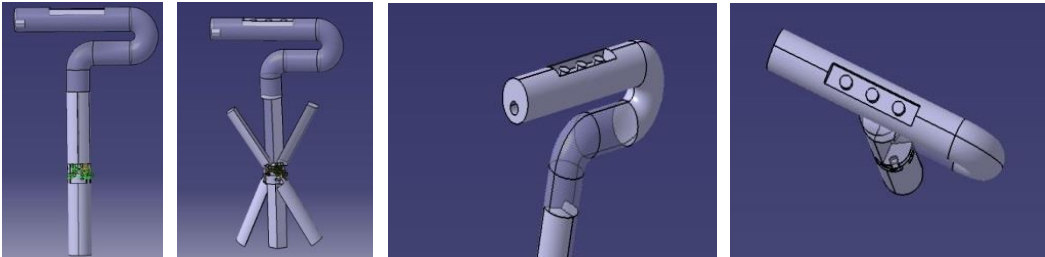
① Chair: When they are walking and need to take a rest, they take a rest by unfold the stick.

② Light: It helps to walk for older people at night by lightening on the road.

③ Remote Control: They control TV without moving by using the product.

SELF EVALUATION

- It is possible to control many functions using the product.

- The stability is not evaluated clearly. It is solved through the analysis program and designed as the suitable structure.

- TV is controlled by the product but the sensor that is suitable for each TV is necessary

- People have different height. So, it is efficient to install the control of length for older people.

SP!ED 2015

Product Name: Multi-chair

Members:

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ABSTRACT

According to research on Korea and China, in aging society, there are more double income families. As a result, grandparents tend to take care of their grandchildren. Research on Seoul and Shanghai also shows that average living space is limited, which is only little more than 70m². To reduce the burden of looking after children for the elderly and save space in the apartment, we design a multi-chair for families both having the elderly and children in main cities of Korea and China. Multi-chair acts as a common seat for the elderly, however, half part of its back can be driven by two servo motors and rotate particular angle to become a comfortable meal chair for babies (aging from 1-2), which saves space. In addition, wheels have been installed at the feet of the multi-chair, which makes it easier for the elderly to move the child, which reduces their burden. The function is realized by the Arduino.

PURPOSE

Firstly, it can reduce burden of taking care of babies for the elderly. Babies would love to be hung and moved while the elderly don't have enough strength. Multi-chair with motors and wheels can help.

Secondly, it can save the place. Many materials are needed when taking care of the babies. This chair can be not only a normal chair but also a children's chair.

CONCEPT & IDEA

The multi-chair is designed for the elderly who take care of their grandchildren. The chair acts as a common chair for the elderly, however, it can turn to a baby seat controlled by a button. It also has wheels and parking brake.

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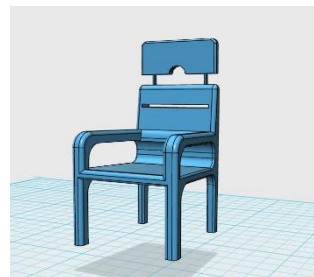
DESIGN & FUNCTION

Firstly, we made the body part using foamed plastic, and then attached wheels. Glue gun has been used for attaching.
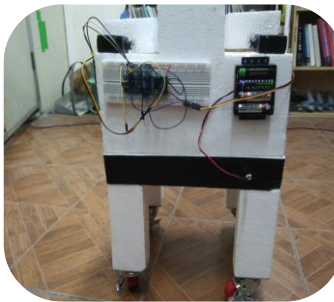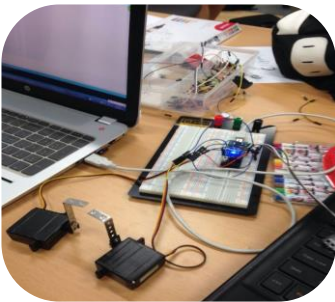
Secondly, we made circuit and controlled servo motors by using 'Arduino'. Finally if we press the side button then it can operate. A common seat can be changed to baby seat easily.

SELF EVALUATION

Our product is good for double income families both having the elderly and babies, especially in Korea and China. It is a common phenomenon that the elderly tend to look after babies instead of young parents. The multi-chair can make it easier for the elderly to take care of babies and also save space in apartment. Several functions have been realized in this product, but to be honest, the chair can be improved by adding more useful functions. In this program, the best thing we got is our friendship. We also learned how to cooperate and learn from each other.

SP!ED 2015

Product Name: Smart Refrigerator

Members:

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ABSTRACT

The product of Team G is a smart refrigerator, which is designed for children, the elderly and the disabled. Smart refrigerator can solve the problem that users cannot get the food on the top floor. It is easy to operate, users can control the refrigerator by voice or button. When the refrigerator received the signal, the top floor will come down to the proper height automatically. Our product is suitable for many places such as Kindergarten, Old people's home, Hospital or Home. Firstly, our team use CATIA to design 3D model of refrigerator, and secondly use 3D printer to print the core components. Finally, we use Roborobo components to connect all parts of the refrigerator structure. Our smart refrigerator also equipped with Arduino system. Then we can edit the voice control program and butter control program to realize the function.

PURPOSE

The purpose of our product is to help people get the food on the top floor of refrigerator.

CONCEPT & IDEA

Fig. 1 Potential Users and the Solution

For many people, the refrigerator is too high to get the food on the top floor. To solve this problem, we can use motors to switch the top floor and the bottom floor, or let the top floor come down.
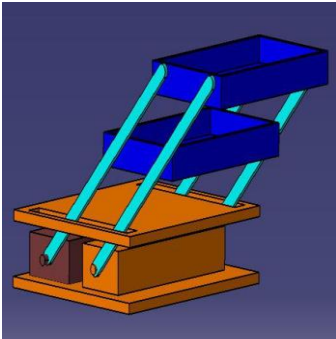
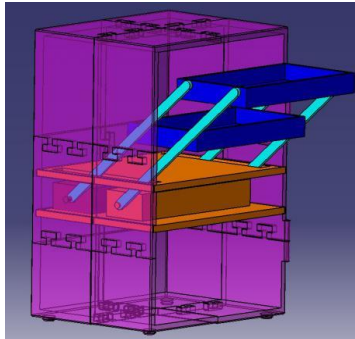# DESIGN & FUNCTION

Fig.2 Link Mechanism
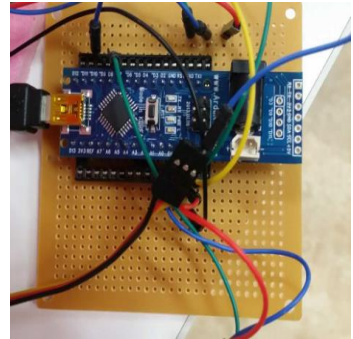

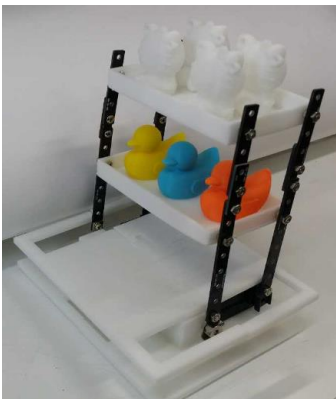Fig.3 Total 3D Model

Fig.4 PCB Circuit

Fig.5 The Initial Position

Fig.6 The Lowest Position

Fig.7 Real Refrigerator

According to the instability of parallelogram, the top floor will come down by rotating the stick. At the same time, the food boxes can also keep upright.

SELF EVALUATION

Our product is very useful. Using this smart refrigerator, children and the elderly can get the food on the top floor conveniently. We have tried our best to make our product looks like the real refrigerator. At first, we want to use belt drive mechanical structure but it takes up a lot of space and power. After group discussion, we improve our product by using link mechanism, which can solve the above problems. We are Team Great, and our product is great!