Robot Programming

Syllabus

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Overview

- Instructor
  - Prof. Min youn a
  - Office : 산학협력관 318
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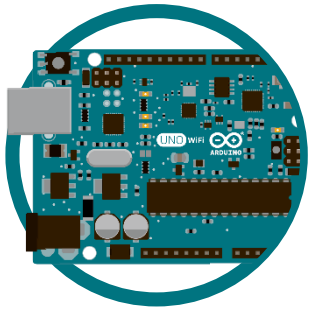
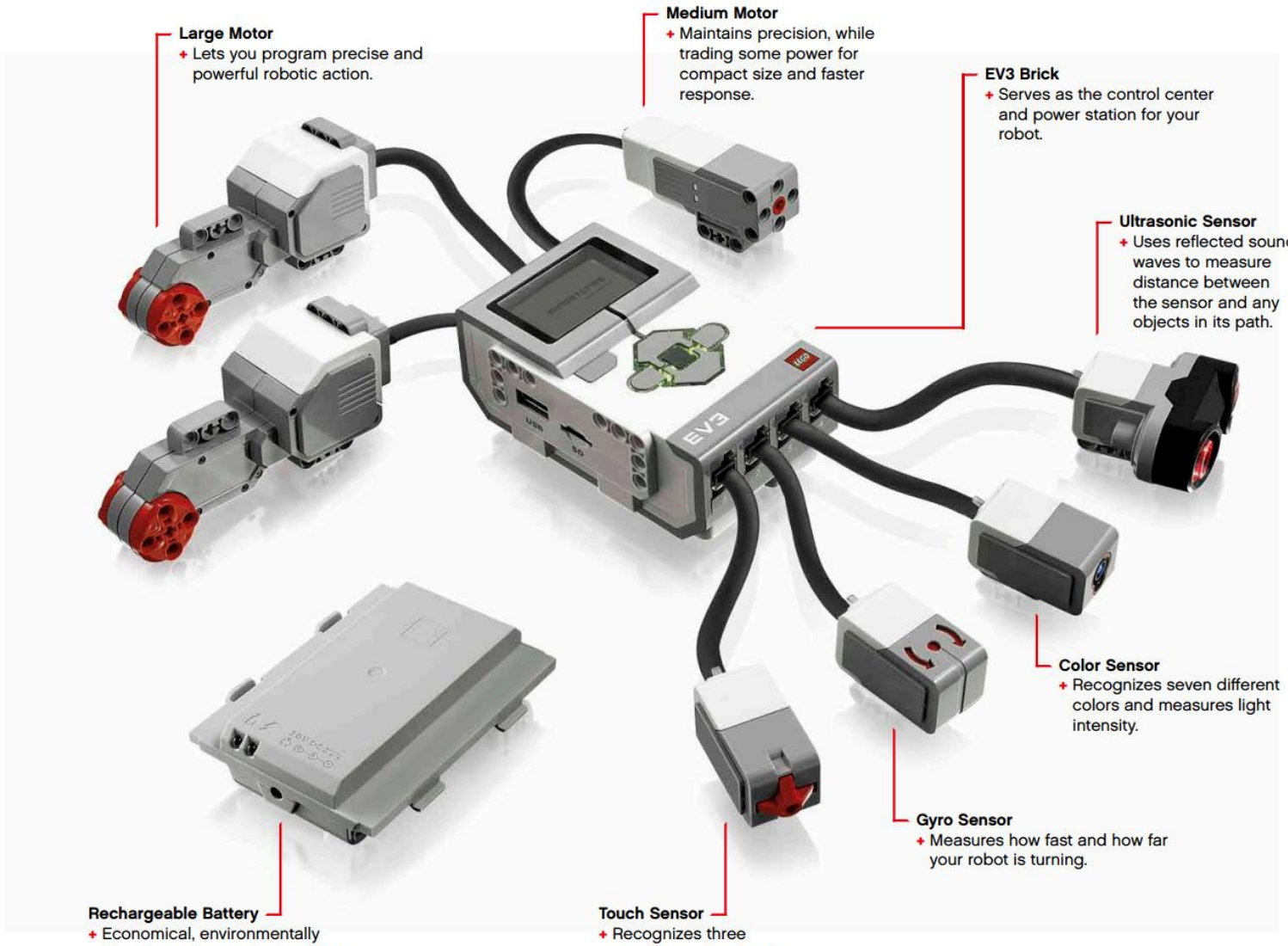
  - Office hours: 5-6PM, Mon, thu (By Appointment)
  - Resources: http://cyber.gachon.ac.kr

Course Overview

- Course goal
  - Understand fundamentals and related theories of embedded programming
  - Understand basic usages of software tools
  - Understand how to develop applications using various sensors and actuators
- Notes
  - Use Arduino Uno & LEGO Mindstorms
  - **Strong focus to lab activities and term projects**



Lego Mindstorms EV3



Example Lab Activity

- Simple line tracer using Mindstorms

https://www.youtube.com/watch?v=9YLxIUn7avY

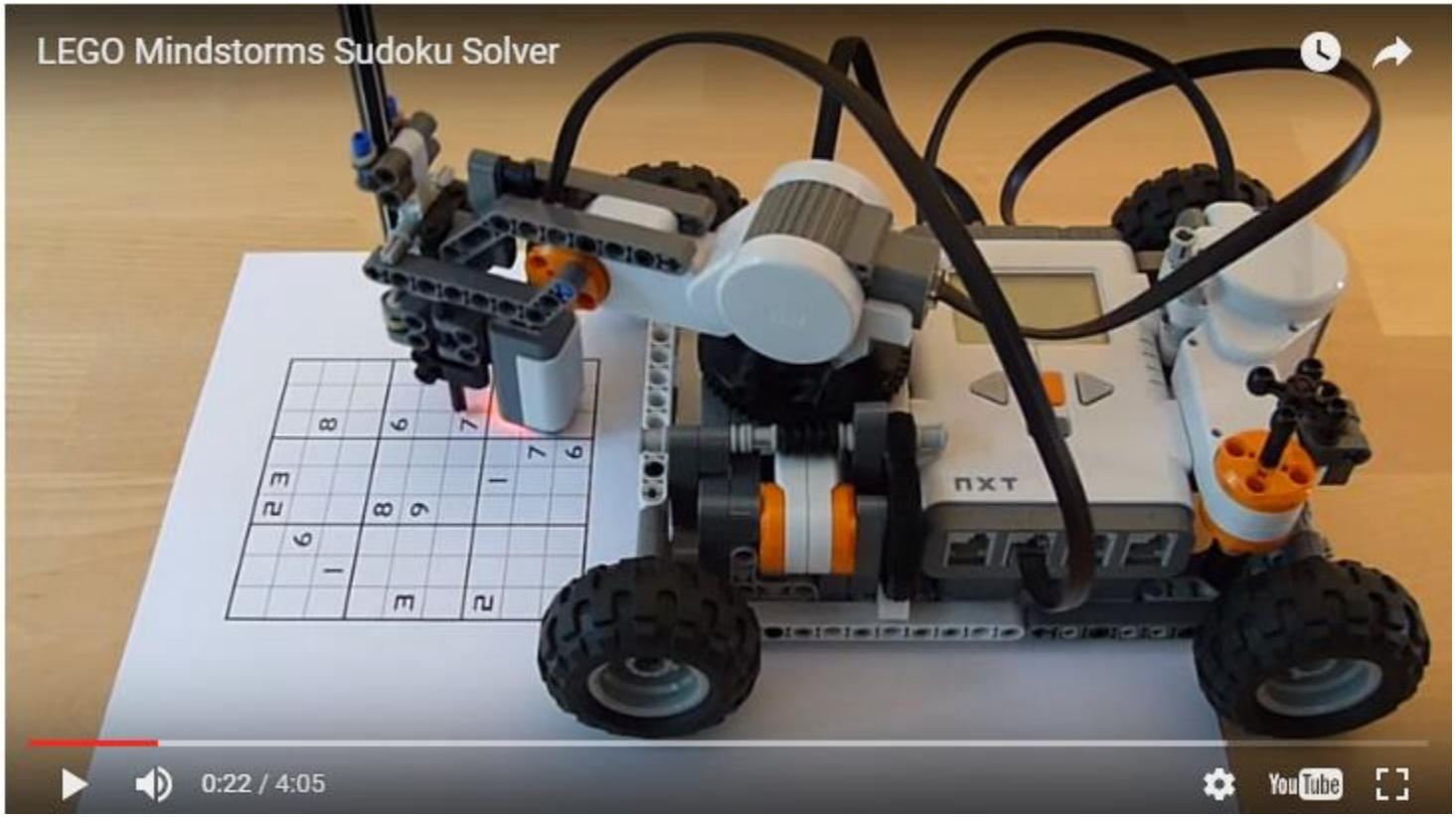
Arduino-Controlled Lego Mindstorm Hand

이원상, 김윤진, 이성민

Example of Lego Mindstorms projects

https://www.youtube.com/watch?v=-7cjLoNEjC4

Example of Lego Mindstorms projects



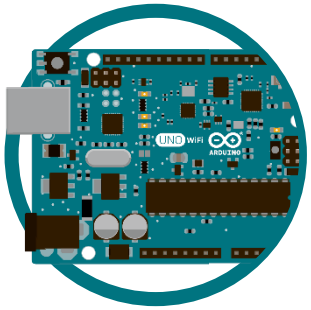
https://youtu.be/Mp8Y2yjV4fU

http://tiltedtwister.com/sudokusolver.html

Course Overview

- Textbook
  - No specific textbook – lecture material will be provided
- Tools
  - Arduino IDE (free license)
  - RobotC (software and in-class license will be provided)
- Plan for each week
  - 1 hour presentation – covering theories
  - 3 hour exercise – lab activities

Lecture Plan



- Part 1: Arduino
- (Mid-term)
- Part 2: Lego Mindstorm
- (Final Exam)

- Theories
  - History, architecture, and fundamental theories
    - Robotics and Microcomputer
- Lab activities
  - Arduino
    - Basic programming
    - Various digital components (sensors/actuators) in Arduino
  - RobotC using Mindstorm
    - Basic programming
    - Various sensors in RobotC
    - Precise motor control using RobotC

Input을 주는게 센서, Actuator는 출력해주는거.
Actuator는 그래서 speaker, led 등등

Lab Activities

- Per each lecture
  - 2~3 problems (within lecture)
  - Note that solving some problems will be time-limited so that it's score will be applied for your total grade.

- Example
  - Develop a traffic light using LEDs in Arduino
    - Evaluation based on your accomplishment
  - Develop a robot as follows:
    - Start from entrance of maze
    - Find exit of maze
    - Back-trace through optimal path
    - Evaluation
      - Find exit (10 points) + back-trace (10 points) + time (10 points)

Term Project

- Develop *any* smart things implementing *novel* ideas using the Arduino
  - Schedule
    - Week 01--02 : team member selection (2~3 persons)
    - Week 03--05 : topic selection
    - Week 06 : prototype design
    - **Week 07 : plan presentation**
    - Week 08--09 : implementation
    - Week 10--11 : implementation
    - Week 12--14 : improvement
    - **Week 15 : final presentation & demo**

※ For various open projects using Arduino, you can take a look at https://create.arduino.cc/projecthub
※ Visit the website and get some hints for your term project.

유튜브 이용, 결국 아이디어가 중요

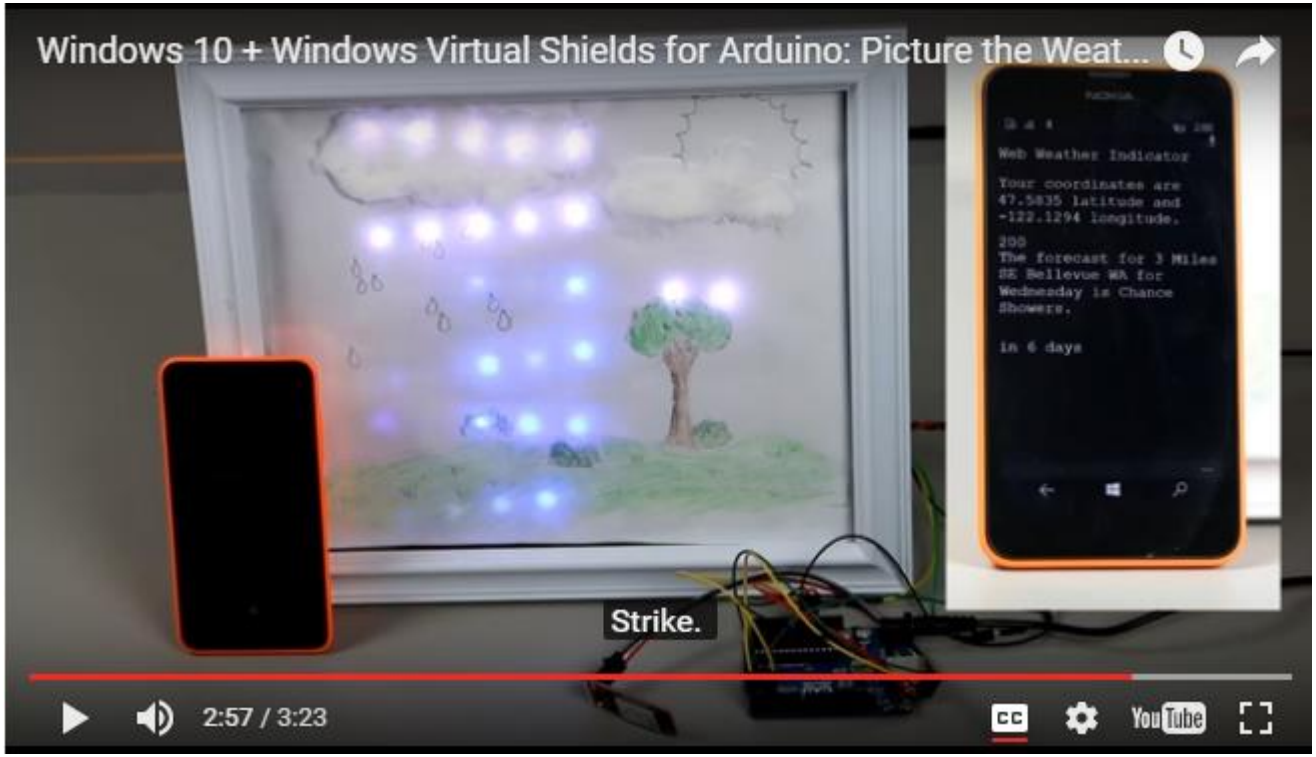
Grading Policy

- Total 1000 points
  - Attendance (100 points)
  - Quiz + Lab (200 points)
  - Mid-term exam (250 points)
  - Final exam (250 points)
  - Term-project (200 points)

Question?

Appendix

Example of Arduino Projects



https://youtu.be/GI80hujxg6k

Example of Arduino Projects

https://youtu.be/sPCXnYc_fTM

Example of Arduino Projects

- The system monitors temperature and humidity of the place, and soil moisture of the ground, waters the plant remotely, then saves all data to DynamoDB through AWS IoT. Collected data is visualized by different charts and figures to give better understanding of conditions where the plant thrives.

https://youtu.be/-1FG58kGLxQ

Example of Lego Mindstorms projects

- Multi-Bot Ball Shooter Arm
  Interesting ball shooter arm application with a combination between a multitude of sensor, actuators, tracks, and Lego pieces.

https://www.youtube.com/watch?v=14K8dJAYTnA

https://www.intorobotics.com/best-of-lego-nxt-robotic-projects-over-time/