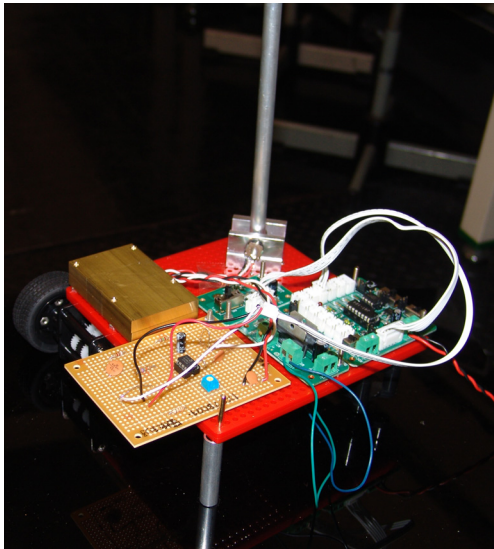
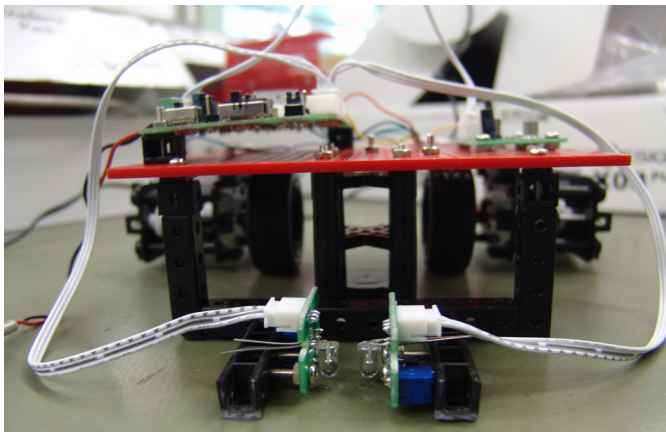


Mechatronics • LAB (2)



Waseda University
School of Creative Science and
Engineering
Department of Modern Mechanical
Engineering



Prof. Atsuo Takanishi
Dr. Jorge SOLIS Jorge



Introduction

Dept. of Modern
Mechanical Engineering
Mechatronics・LAB(2)

- Keywords :

- ① PBL(Project-based Learning)

Basic experiments related to: construction of PCB, microcontroller programming, implementation of control methods, introduction to PID Control, etc.

Task experiments related to the construction of a robot system

- ② TBL(Team-Based Learning)

Teams are composed by 3 members.



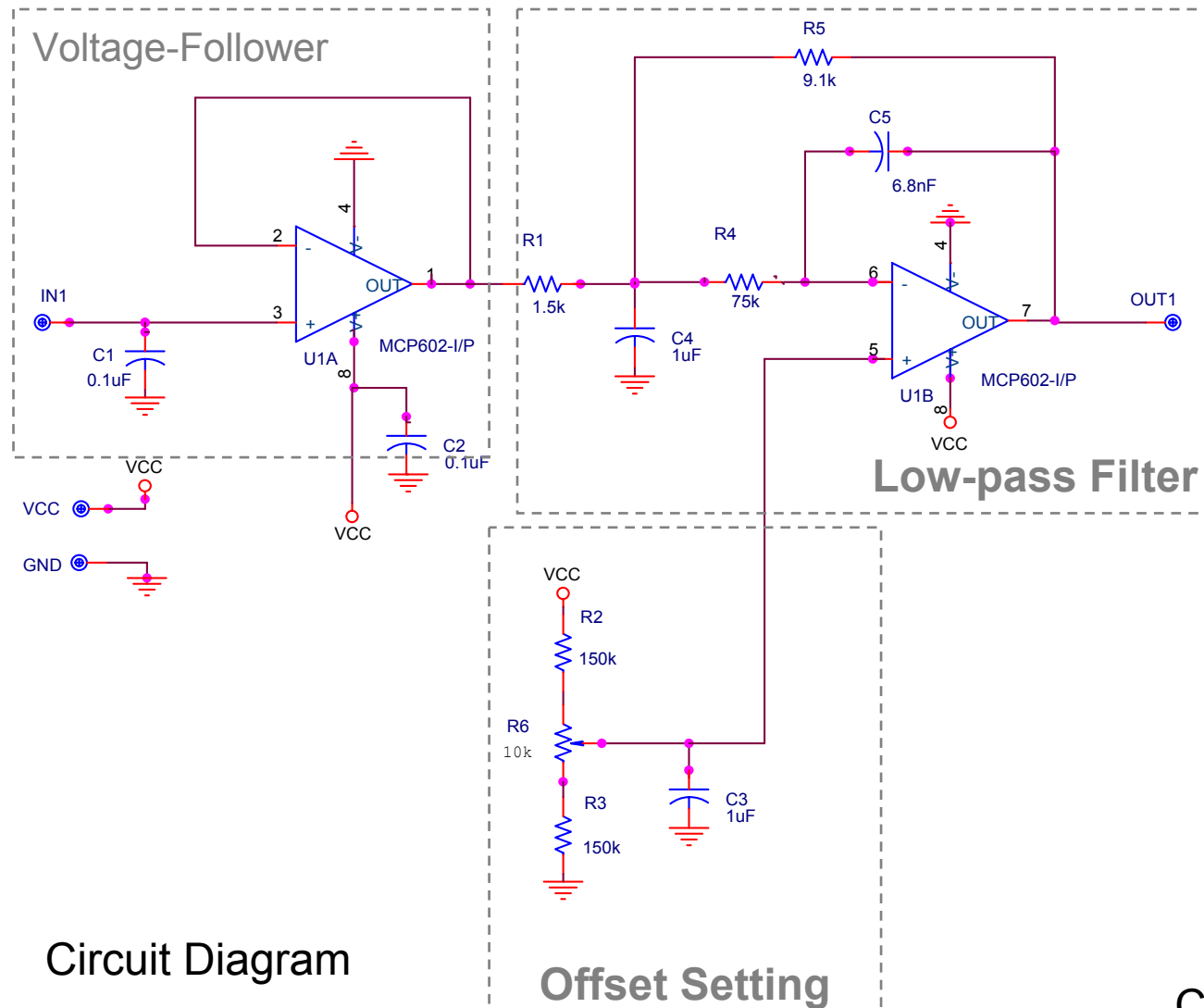
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LAB1: Experiment Contents

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- Construction of a printed-board circuit and confirmation of the sensor signal processing function



Circuit Diagram



- Control of robot motion based on tile-programming.
- Introduction to Tile-Programming by processing the input/output signals using RoboDesigner.
- Introduction to C-Programming by processing the input/output signals using RoboDesigner.
- Processing of sensor information using RoboDesigner.

HW Configuration

Tile-Programming

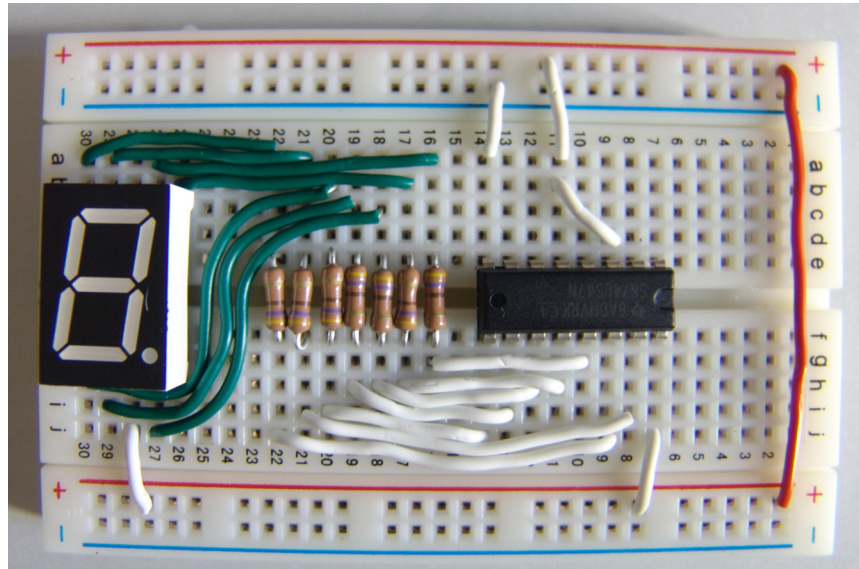




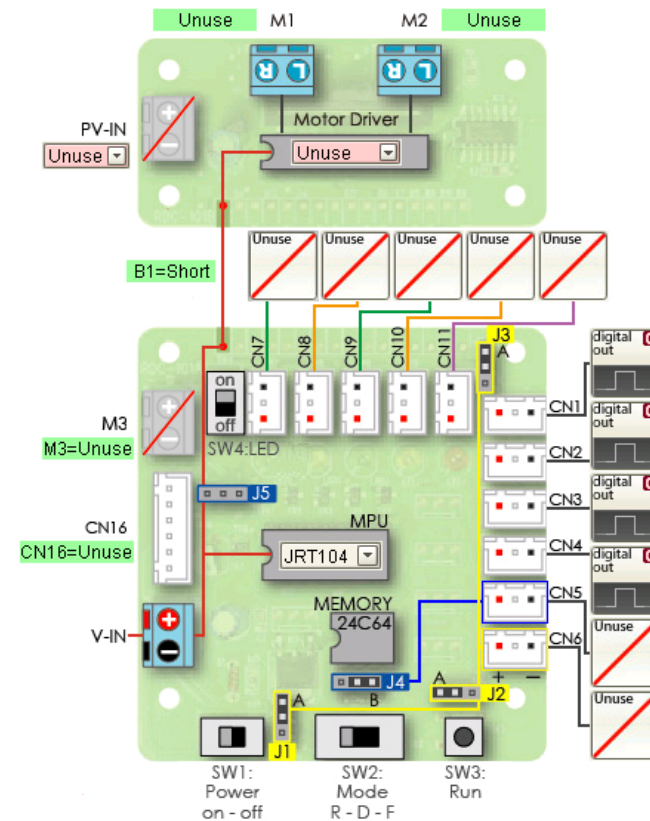
LAB4: Experiment Contents

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- Control of a peripheral device a 7-segement LED using RoboDesigner
- Understanding the use of interruptions by controlling the functions of a 7-Segment LED.
- Development of a chronometer.



7-Segment LED Circuit



HW Configuration

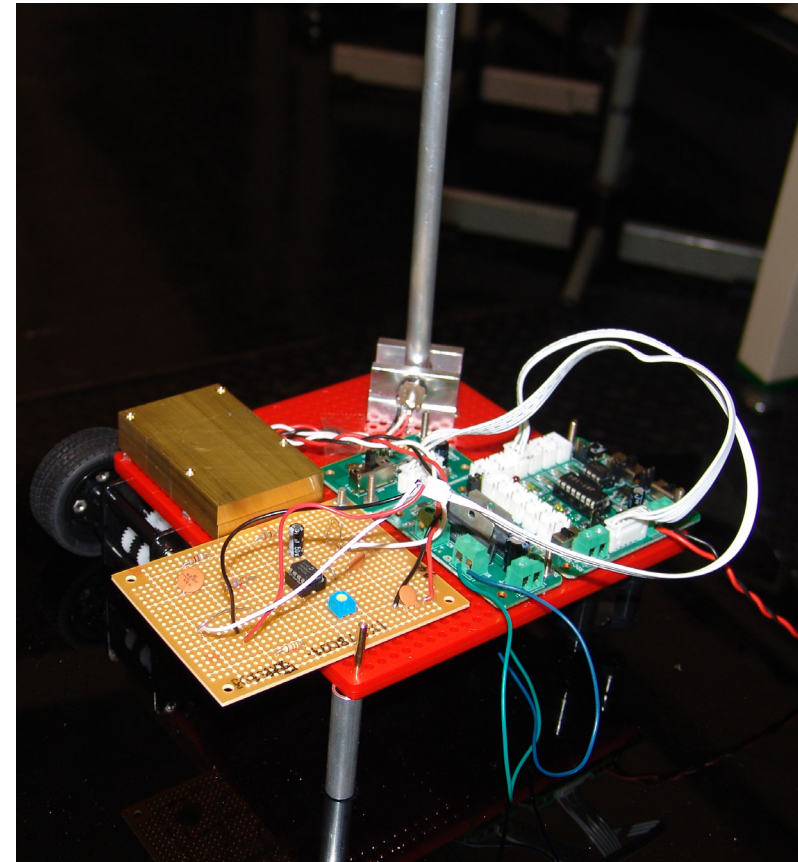


LAB5: Experiment Contents

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- Understanding the principles of control theory by using an inverted-pendulum system using RoboDesigner

Parts	Qty
① Controller (RDC-101)	1
② Gear-box (RDO-501)	2
③ Communication Board (RDI-301)	1
④ Universal Plate (RDP-801)	2
⑤ Universal Caster (RDP-806)	2
⑥ Pole (1m)	1
⑦ Pole's mounting	2
⑧ Rotary Sensor (RDC-506)	1
⑨ Filter circuit	1

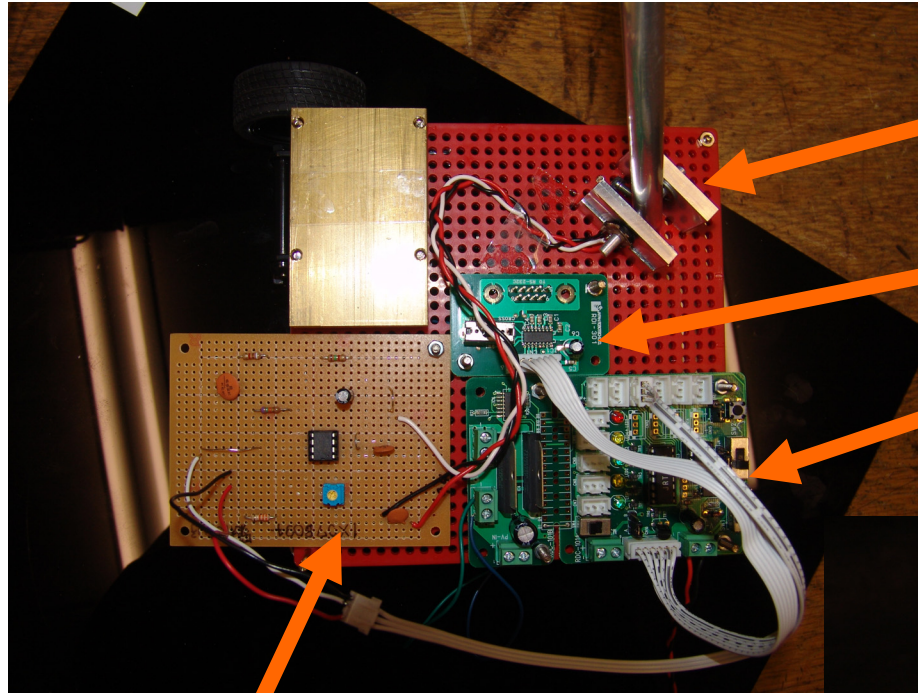


Inverted Pendulum's Prototype



LAB5: Experiment Contents

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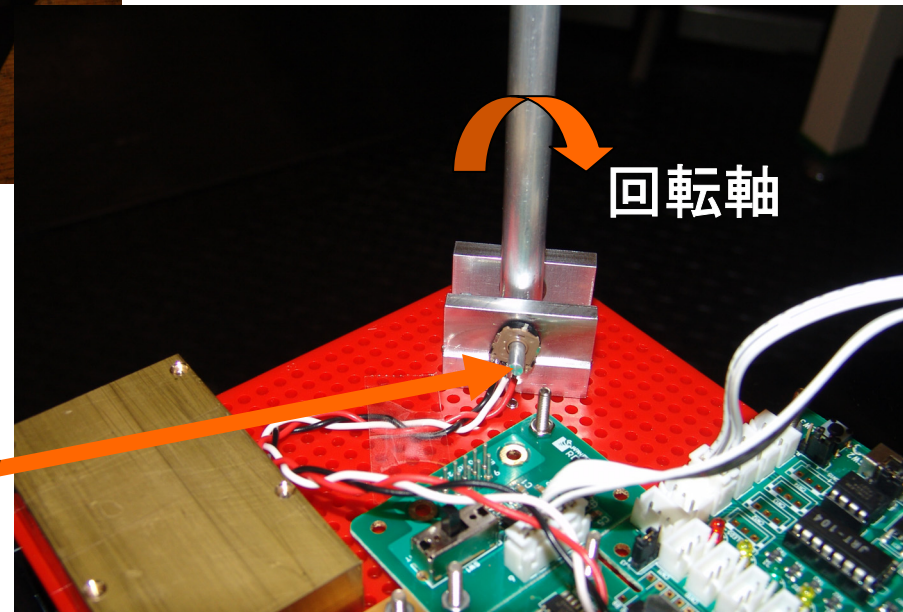
⑦ Pole's mounting

③ Communication Board

① Controller

⑨ Filter Circuit (LAB1)

⑧ Rotary Sensor

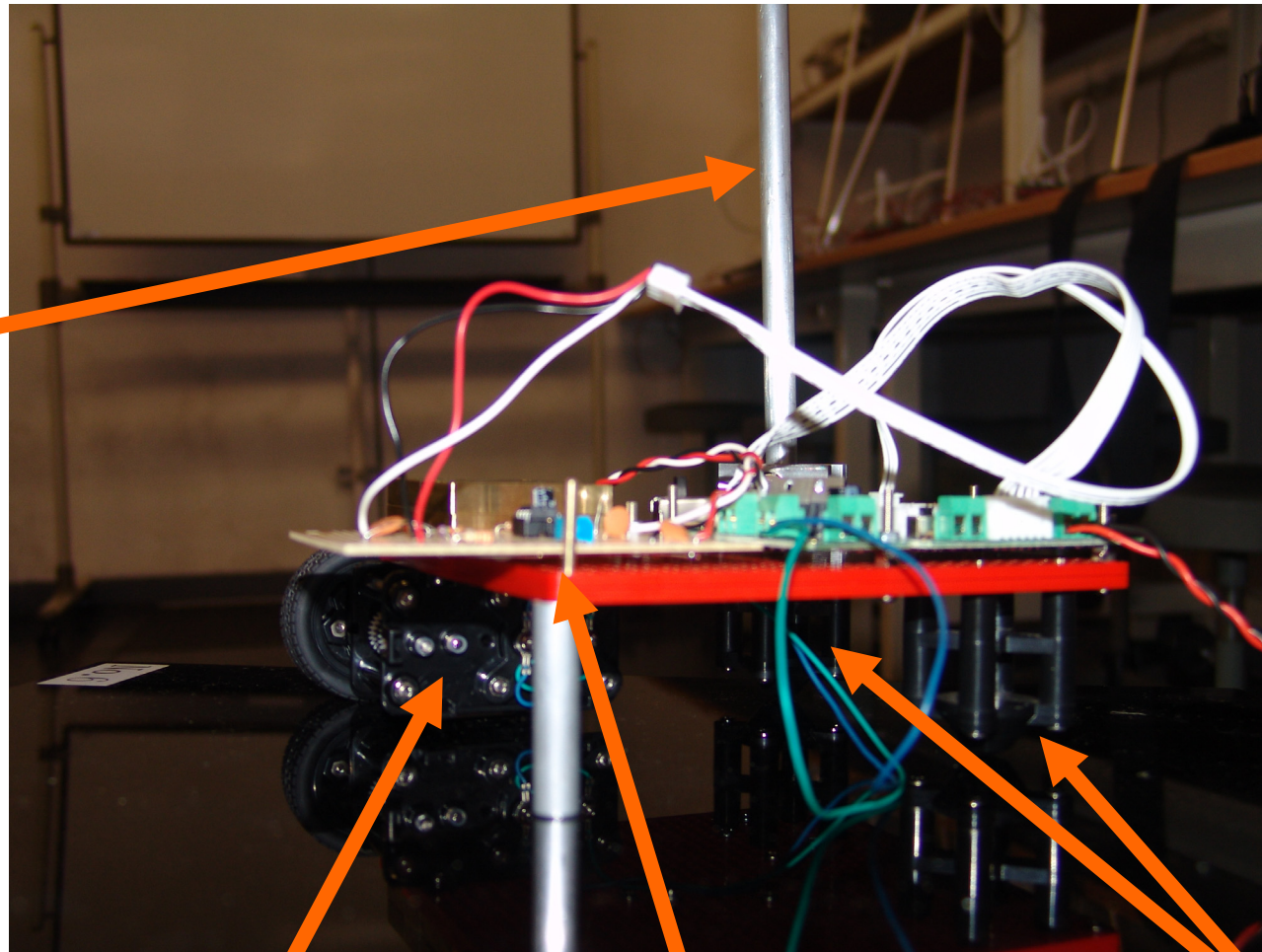




LAB5: Experiment Contents

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⑥ Pole



② Gear-Box

Rotation
Axis

⑤ Universal Caster

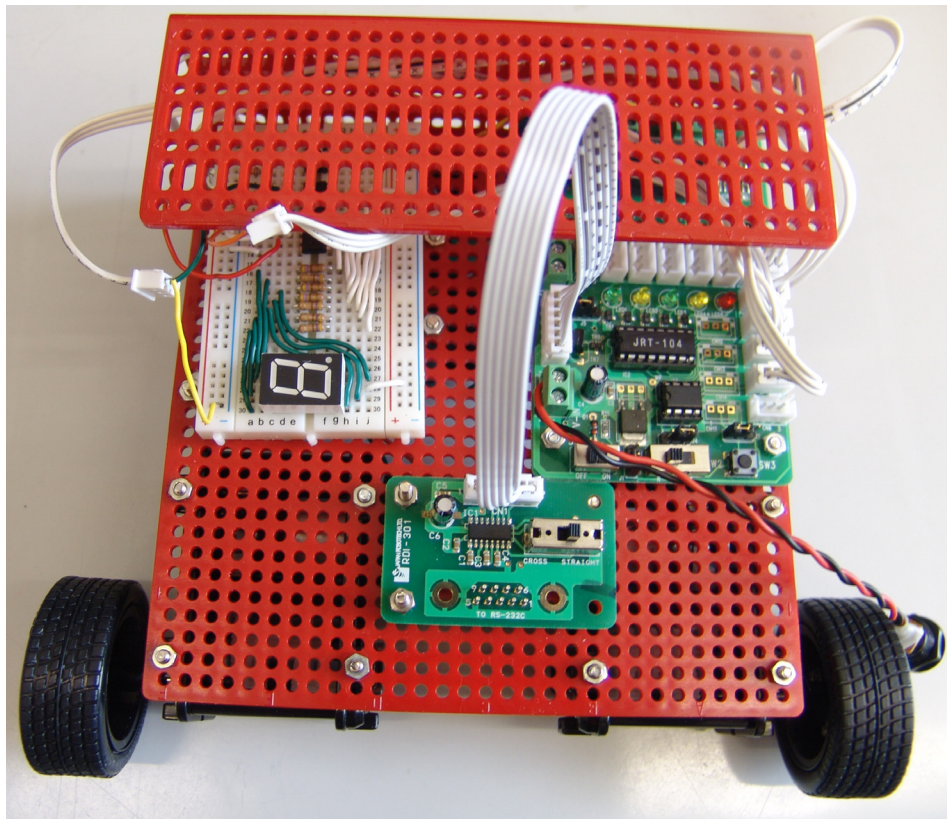
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LAB6: Experiment Contents

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Mechatronics・LAB(2)

- Lab2～5の基礎・課題実験を想起して、マイコンによるLFロボット (Line Following Robot) の制御プログラムを製作する.
- LFロボットはRoboDesignerの製品を組み立てる.
- 走行テストをして各部やプログラムの調整をする.



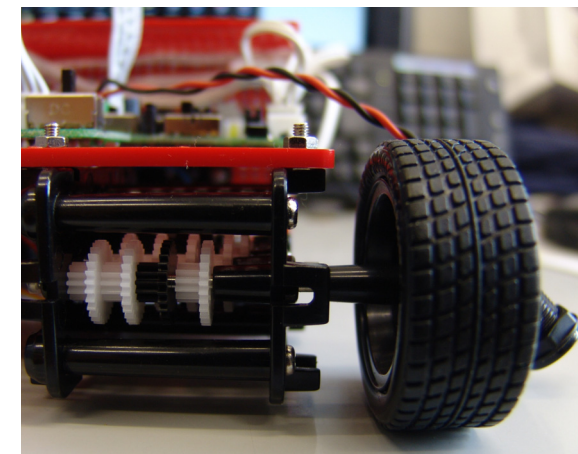
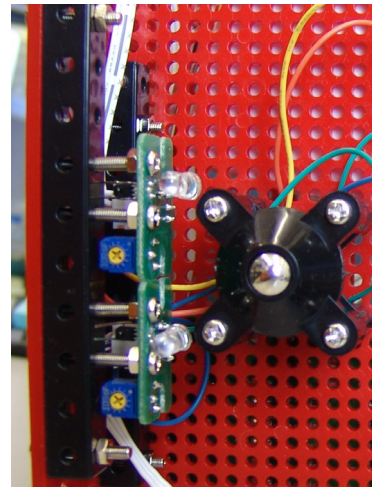
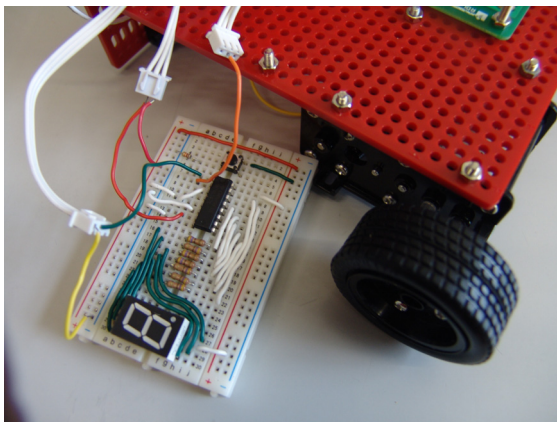
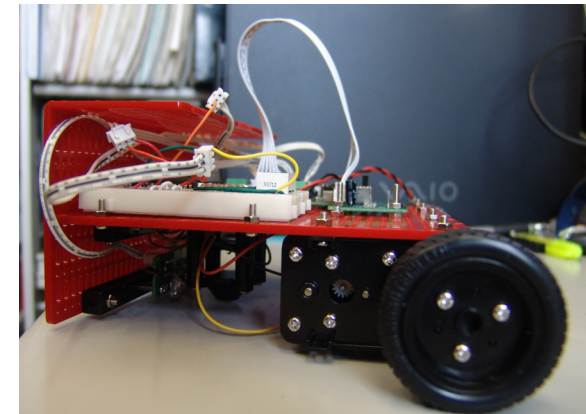
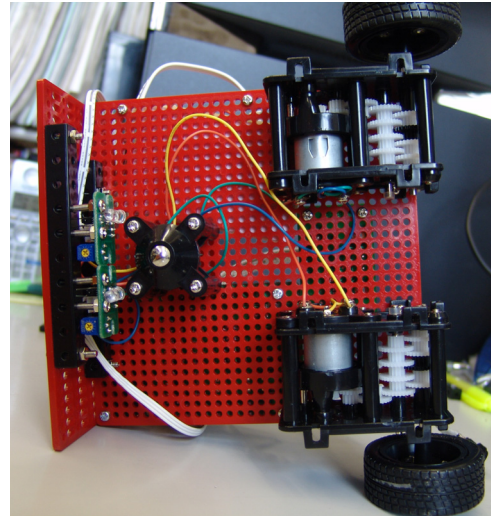
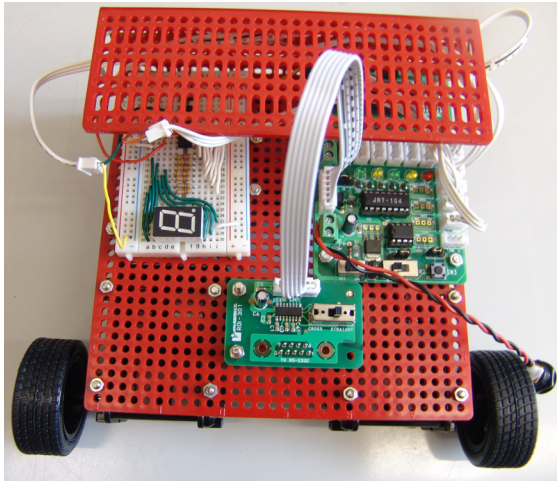
Parts	個数
① Motor	2
② IR Sensor	2
③ Controller	1
④ Communication Board	1
⑤ Universal Plate	2
⑥ Universal Pillar	2
⑦ Universal Caster	2
⑧ Cable	5
⑨ 7-Segment LED	1

LFロボットのプロトタイプ



LAB6: Experiment Contents

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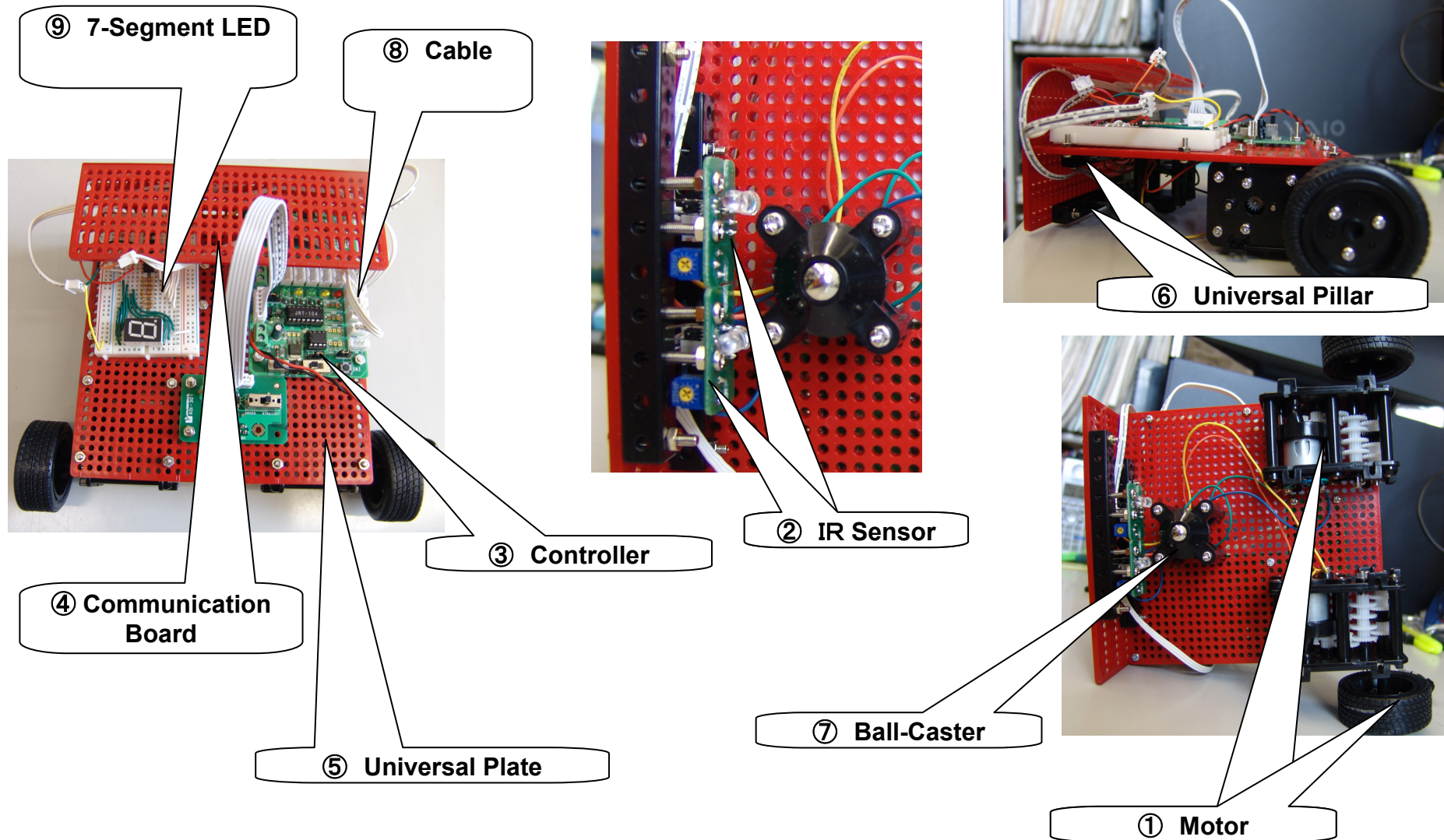
Line-Following Robot's Prototype

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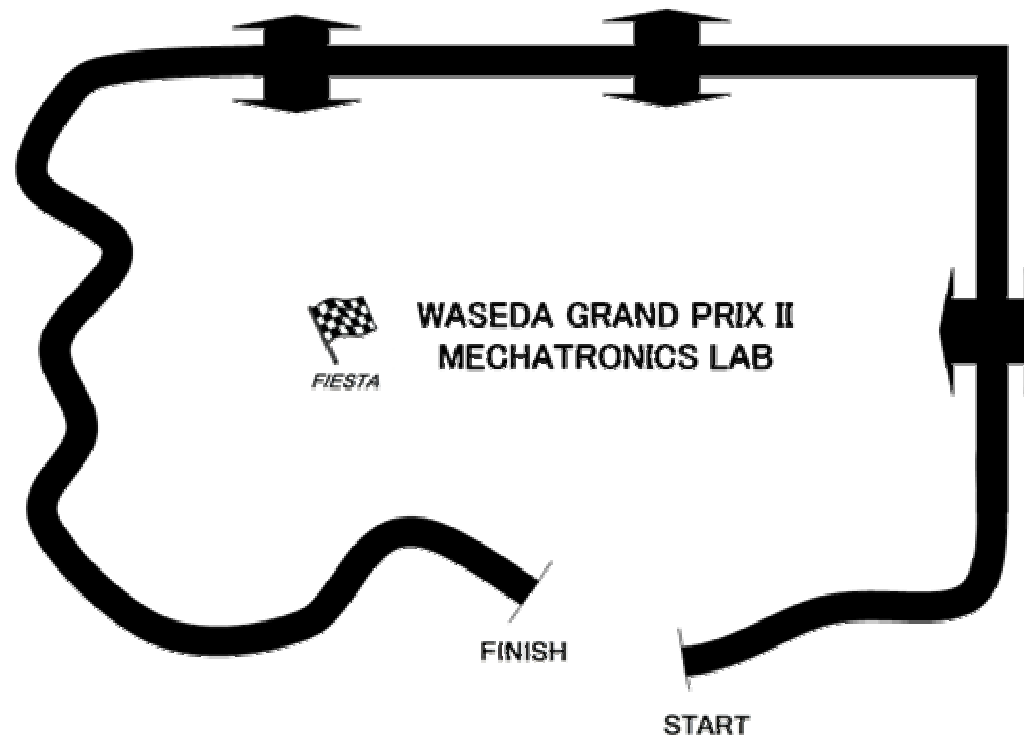
Line-Following Robot's Prototype



Robot Contest

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- The objective of the contest is to develop a line-following robot using RoboDesigner.
- Each team must build one LF-Robot.
- The LF-Robot must use the microcontroller included on the RoboDesigner kit.
- The contest consist on building a LF-Robot which should move from the START to the FINISH as fastest possible.





Robot Contest

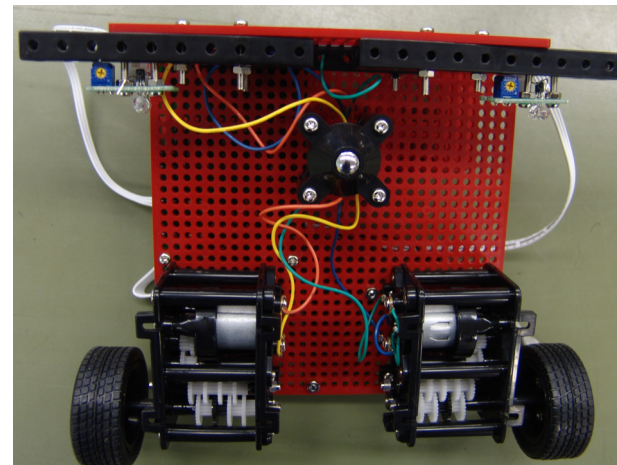
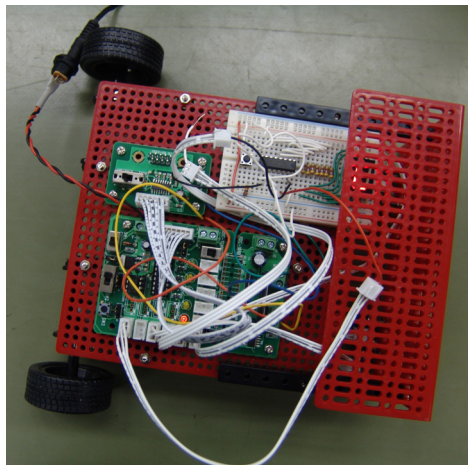
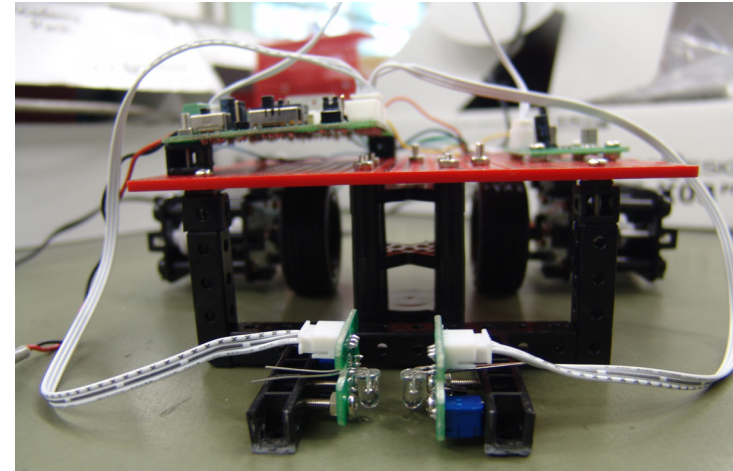
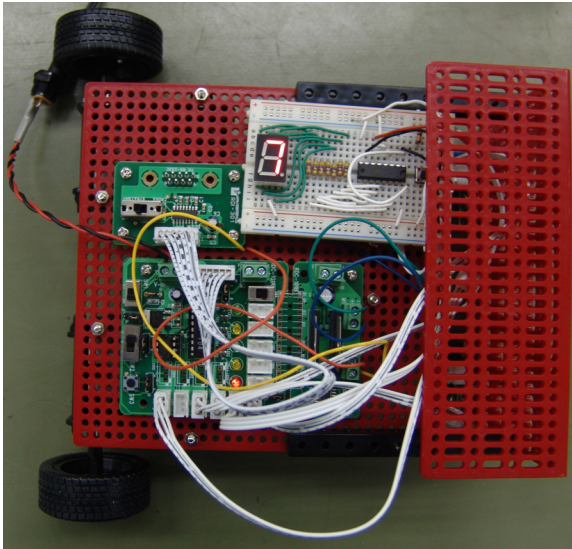
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- In relation to the robot contest, the LF-Robot must be built using the RoboDesigner Parts.
- In principle, the LF-Robot body characteristics are fix; however, additional parts can be used (confirmation from the instructor).
- The LF-Robot power supply is fix to +9V.
- Every team can try the line course three times using their robot during the contest.
- The fastest timing among the three trials is used for the final result.
- The dimensions of the robot's body are fix and those are based on the dimensions of the universal plate (Dimensions: 155x155mm, Height: 3mm).
- The 7-Segment LED should be connected using a breadboard to the LF-Robot in order to display the internal status of the robot.
- The timing is measured from the START line to the FINISH line.
- In case the robot goes out of the line course, the trial is missed.



Robot Contest

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Screenshots of Line-Following Robot developed by students

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END