



AGH



HKUST



Aalto University



UNIVERSITY OF
TORONTO



西安电子科技大学
XIDIAN UNIVERSITY

TESP 2017 SUMOBOTS

Team

Dagmara Uhl (AGH University of Science and Technology)

Manohar KUSE (Hong Kong University of Science and Technology)

To Doan Ngoc Hai (Aalto University)

Carrie Yan (University of Toronto)

Mengxue Bao (Xidian University)



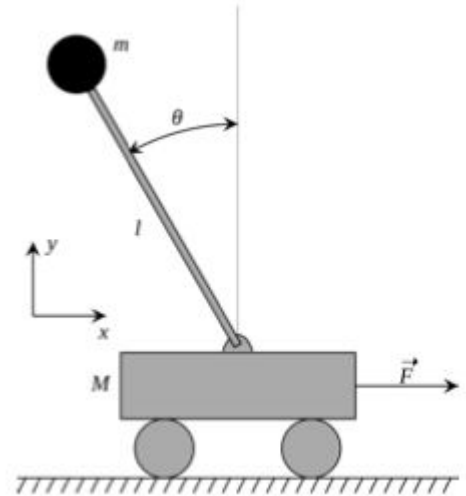
TOHOKU
UNIVERSITY

The Challenge

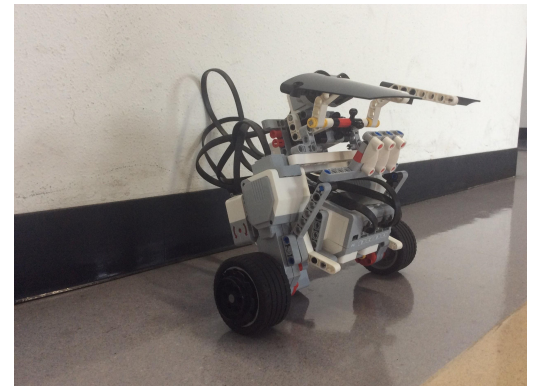
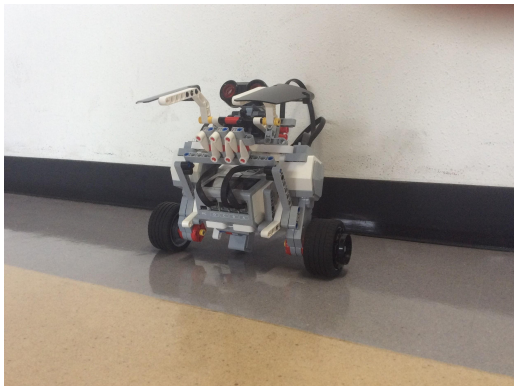
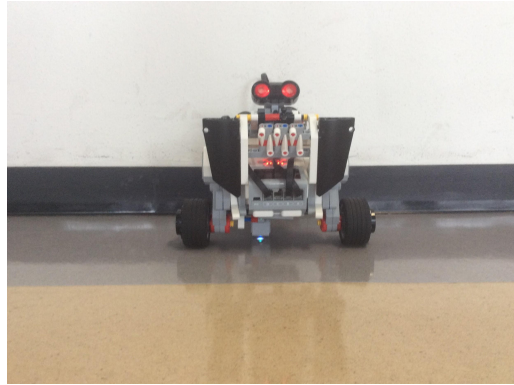
- Design and assemble the robot
- Program the self-balancing and attack/defense behaviors

The Sumo Rules

- Each robot must try to win by:
 - Making the other robot lose balance and falling
 - Push the other robot out of the Sumo ring
- If a robot falls or exits the ring, that team loses



Design of stable robot configuration



SENSUTO

Sendai

Sumo

Tohoku University



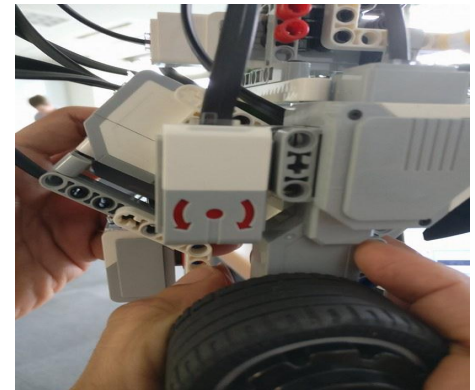
The self-balancing function

proportional term

integral term

```
// This is the main balancing equation  
int power = (int)((KGYROSPEED * gyro_speed + // Deg/Sec from Gyro sensor  
                  KGYROANGLE * gyro_angle) / ratio_wheel + // Deg from integral of gyro  
                KPOS * motor_pos + // From MotorRotationCount of both motors  
                KDRIVE * motor_control_drive + // To improve start/stop performance  
                KSPEED * motor_speed); // Motor speed in Deg/Sec
```

motion control



The self-balancing function



The attack behaviors

- . step 1: balance and wait until opponent get into the range (<40cm). *Sonar Sensor
 - . step 2: opponent robot detected, move forward with increasing speed till speed limit
 - . step 3: at 6 cm from the target, activate the arm
 - . step 4: back off about 20 cm from the target
- repeat if the opponent robot is still in range

The attack behaviors



Actual Results

Fights

Results

Winner: G.Y.R.O.B.O.I.

2:1

Loser: SENSUTO

Thank you for listening

Special thanks to Hirata lab and Mr. Jose for technical help and support.