The Robots of the Rings: The Two Towers

6.270 Kickoff 2014
The Organizers

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The Story So Far...

Frodo and Sam have destroyed the one ring, but destroying so much evil at once has put the world out of balance. In order to bring the world back to order, Gandalf asks for their help again in locating new rings of power and gathering them around the two towers. However, exhausted from their first (very, very long) excursion across Middle Earth, Frodo and Sam decide they’d much rather sit this one out.

Your task as mechanic from Legoton is to build a robot that can help Gandalf on his quest and let Frodo and Sam get their well deserved rest. You have to build quickly however, as Gandalf leaves in one month.
The Towers
The Dispensers

Low Dispenser

High Dispenser

Dispenser

Lever

Wall

Dispenser

Lever

Wall

3"

9"
Scoring

**Explore** 100 points for reaching target zone

100 points per ring hung on a new side

**Recover** 10 points per ring recovered

**Deposit** 25 points per ring around base of tower

100 points per ring on tower

x2 bonus per ring on a balanced tower
General Rules

Robot starts in 1x1x1 ft cube
All structure = Lego
No detachable parts
Rubber bands for stored energy
Tape/glue ONLY for attaching motors/sensors to Lego
No Lego modifications except large dark-gray baseplate
Sportsmanship (don't attack opponent)
Drop Test

Robot must survive 3ft drop test - must have motors installed and be able to drive

Why? To encourage robust designs

Must pass drop test before final competition
Sensor Points

Only parts provided in kit are allowed

Can “buy” more electronics/sensors with 20 free sensor points - see website for sensor prices

Spend up to $30 of your own money on extra sensors not in the kit
Final Competition

Tuesday, January 28th

7pm

26-100

Open to the public - invite your friends to cheer you on!

Streamed live online - show your parents!
Administrivia

- If you haven't gotten emails, talk to staff or email 6.270-organizers@mit.edu
- Lab hours: 9am - 11pm
  (staffed from noon to close)
- Grading P/D/F - 6 units - to pass:
  - Qualifying robot
  - Team attendance
  - Robot web page and source code due at end of course
Lab Guidelines

- No food!
- We are guests - there is expensive equipment - leave it alone or 6.270 will be kicked out
- Only solder or hot-glue in 38-500
- NO FOAM TAPE ON ANYTHING!
Happyboard Introduction

- Programmable microcontroller
- Lots of I/O:
  - USB
  - 8 digital IO
  - 16 analog inputs
  - 4 high-speed encoder
  - 6 DC Motors
  - 6 Servos
  - Wireless
  - I2C
  - LCD
Power Switch
USB port
GO and STOP buttons - user configurable
Microcontroller (tiny computer)
ATMega128
Encoder Inputs
Analog Inputs
Digital Inputs
Green: Signal (input)
Red: +5V
Black: Ground
6 Motor Ports

Motor Drivers
6 Servo Ports
FPGA (high speed I/O: servo control, PWM, encoders)
Batteries

- 2 Lithium-polymer Batteries
  - 800 mAh for logic
  - 2200 mAh for motors
    - 20 amps continuous!

- LiPoly Chemistry:
  - 7.4V (2-cell batteries)
    - Nice discharge curve
    - High energy density
  - Beware: under voltage
  - Beware: over-charge
More Batteries

- Very high energy density means catastrophic failure if abused!
  http://www.youtube.com/watch?v=d4lNx2Wn6Oc&feature=player_detailpage#t=8s
- Don't leave charging unattended!
- Don't leave charging overnight!
- Seek TA immediately if battery wires come loose or if battery swells up
Schedule: Big Picture

This week
- Build chassis/drivetrain
- Driving straight
- Navigate to points
- Testing

Week 2
- Fine-tune navigation (e.g. optimize turns)
- Build manipulation Devices
- Testing

Week 3
- Implement Strategy
- Testing
- Testing
- Testing
Thanks!

• Turn in your media and safety forms to the front
• Kit building will begin in 38-600 at 12:30pm

• Questions? Concerns?
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