

6.270

Autonomous Robot Design Competition

Lecture 1
January 4, 2000

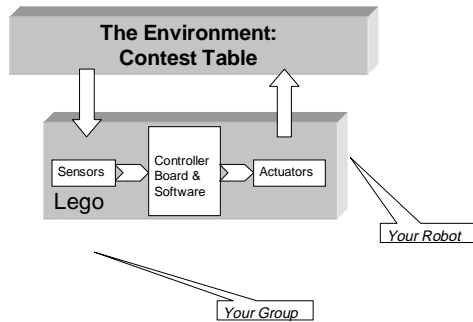
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Today's Agenda

- Introduction to 6.270
- Administrative Stuff
- Contest Theme
- Contest Rules
- Teamwork & Strategy
- Kits, Tool Store, Sensor Store

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6.270 in One Picture



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A Little About Us

- Our 15th Year
- 55 → 60 Teams
- Entirely student-run
- Prof. Gill Pratt is our advisor
- Two types of staff
 - Organizers
 - TAs



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Organizers

- Andy Chang
- Adrian Danieli
- Matt Deeds
- Grant Emery
- Edwin Foo
- Anthony Hui
- Geoffrey Phillippe
- Gong Ke Shen
- Morris Tao
- Mouser Williams



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TAs

- Bernard Ahyow
- David Dickinson
- Paul Grayson
- Nathan Ickes
- Kenneth Lu
- Jan Malasek
- Joyance Meechai
- Erica Peterson
- David Robison
- Shane Swenson
- Ray Szeto
- Alexander Yip

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Contacting the Staff

- E-mail
 - 6.270-organizers@mit.edu (Organizers)
 - 6.270-participants@mit.edu (Participants)
- Web
 - <http://mit.edu/6.270/www/>
- Zephyr Instance
- Come to lab!
- Rules questions: 6.270-rules@mit.edu

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Our Sponsors

- MIT EECS
- Compaq
- Ford Foundation
- GM
- Teradyne
- Cypress Semiconductor
- Microsoft
- Guidant
- Oracle
- IBM
- Hawker Energy
- Polaroid
- Lego Dacta



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Course Schedule

Sun	Mon	Tue	Wed	Thurs	Fri	Sat
2	3 Parts Sort	4 Lec 1 10-1PM, 34-101	5 Lec 2 2-4PM, 34-101	6 Recit 1	7 Lec 3 2-4PM, 34-101	8
9	10	11 Recit 2	12	13 Recit 3	14	15
16	17 CLOSED	18 Recit 4	19	20 Recit 5	21	22
23	24	25 Round I 2PM, 26-100	26 Impounding 5 PM, Lab Party: 7PM, Lobdell	27 Round II 11AM, 26-100 Final Contest 6PM, 26-100	28 Clean Lab 2PM	29

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Lab

- Two labs:
 - 6th floor of building 38 (6.111/115 lab)
 - Main Lab
 - Tel# x3-7350
 - 5th floor of building 34 (6.001/004 lab)
 - Annex computer lab
 - For coding only!
- Hours:
 - Mon - Fri 10AM - 11:45PM
 - Sat - Sun 12PM - 10PM

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Getting to Lab

- 5th floor lab
 - Alarm code: 76302*
- 6th floor lab
 - If the 6th floor entrance is closed, enter/exit through 5th floor lab entrance and use the stairs
 - Watch out for alarms!

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Lab Rules

- No food or drink
 - We see it, it's ours
- Do not touch the oscilloscopes
- 6.270-owned equipment stays in designated areas
- Follow any posted rules
- Respect lab staff

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Course Credit

- 6.270 offers
 - 6 units of P/F general elective credit
 - 6 EDP's
- To get credit must pre-register for 6.190 through Websis.
- Not taking the class for credit?? **DO NOT** pre-register!!!
- Have until January 14th to decide whether you want to take 6.270 for credit

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Requirements for Getting Credit

- Build a robot
- Attend 4 of 5 recitations
- Keep a team journal
- Create a website about your robot
- Write a 5-10 page individual design paper
 - Due after IAP

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How the Contest Works

- Broken into rounds, face one opponent during each round
- Round 1 is also the "qualifying" round
 - To qualify, your robot must demonstrate the ability to score.
 - Only robots that qualify can move on to subsequent rounds
- Eliminated if you have two losses.

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How Each Round Works

- Randomly paired with an opponent
- Orientation selected at random.
(towards, away, back, forward)
- 60 second calibration period
- Each round lasts exactly 60 seconds
- Scoring based on state of table at the end of each 60 second round.

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*And now...
This year's contest...*

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MIT Autonomous Robot Competition
Bots in Blue - 2000



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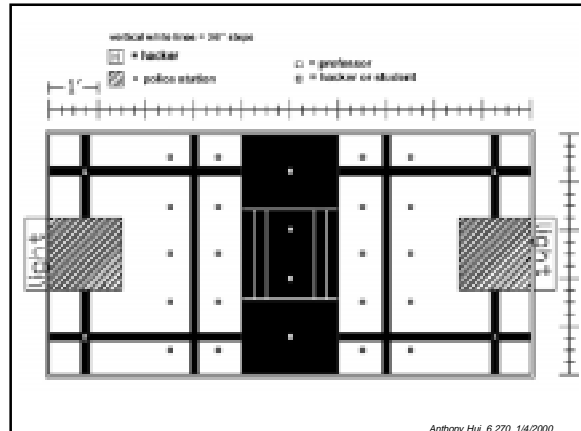
Bots in Blue

In the not-so-distant future, the hacking tradition at MIT is alive and well. To enforce order and counteract the "misdeeds" of MIT hackers, the campus police have decided to use autonomous robots to keep the peace.

In a pilot program, the campus police are evaluating the performance of different robots by having the robots compete against each other. The campus police will select for mass deployment the robot that best eliminates the hacker threat for its assigned campus.

Your mission is to design & construct an autonomous police robot (RoboCP) for the CPs to test. Each RoboCP must scour its assigned campus for hackers and neutralize this threat, while not harassing "innocent" students or professors.

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Features of Table

- 10' long, 5' wide
- Three sections of the table
 - Each robot's jail
 - East/West campus
 - Neutral area
- Blocks
 - 1" wooden cube
 - Hackers, Non-hackers, Professors
 - Hacker blocks have holes drilled in

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The Four States of Each Block & Respective Their Scores

	Off Campus	On Your Campus	Possessed	In Your Jail
Hacker	0	-1	+1	+3
Non-hacker	0	+1	-1	-3
Prof.	0	+3	-3	-9

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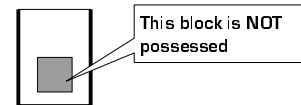
One Special Scoring Feature

- Jailbreak!
 - If your robot is in your opponent's jail at the end of the round, all blocks in that jail are considered to be on your opponent's campus
- When is a robot "in an opponent's jail"?
 - Any part of your robot that was in contact with table at the start of a round must be in contact with opponent's jail

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How to Possess a Block

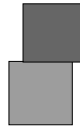
- Any block which moves freely with the robot as the robot is moved in both dimensions of the plane of the playing surface is said to be possessed by that robot



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When is a Block "On Campus"?

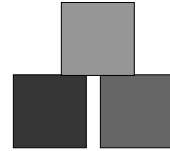
- A block is on campus:
 - NOT possessed
 - Touching the campus or vertically supported by a block(s) that is considered "on campus"



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When is a Block "In Jail"?

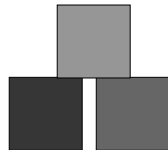
- A block is in jail:
 - NOT possessed
 - Completely within a robot's jail or vertically supported by block(s) that are considered "in jail."



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Scoring Precedence List

- Use the following scoring priority list:
 - Possessed?
 - On campus?
 - In jail?
 - Off campus?



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Robot Rules

- Must fit within a 1'x1'x1' cube & not expand or lift any object more than 16" off the contest table surface.
- All parts of robot must be connected by Lego (cannot break into multiple pieces)
- No parts or substances may be deliberately dropped onto the contest table.

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Robot Rules (continued ...)

- Your robots may not intentionally or attempt to damage another robots controller board or IR beacon.
- Any robot that is deemed to be a safety hazard will be disqualified.



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Lego Rules

- Only Lego parts may be used as structural components.
- Lego pieces cannot be joined by an adhesive.
- Lubricants are not allowed.
- Rubber bands may be glued to wheels to increase friction.

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Lego Rules (continued...)

- The Lego pieces (except the base plate) cannot be modified except to facilitate the mounting of sensors or to perform functions related to the operation of a sensor.



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Sensor & Actuator Rules

- May not be used for structural purposes.
- Each sensor, actuators and other non-Lego parts cannot be attached to more than 5 Lego pieces.
- Sensors may be freely modified to assist its operation.
- Cardboard and tape may be used to shield optical sensors.

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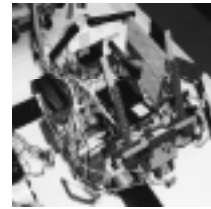
Sensor & Actuator Rules (continued ...)

- Wires should not drag behind the robot.
- Thin rubber bands may be used to store energy
- The wooden dowel may only be used to mount the IR beacon.

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Software Rules

- Robot cannot be told its orientation
- Sensors may be calibrated



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Tips on Surviving 6.270

- Start early, don't procrastinate
- Take care of yourself
 - eat, sleep, shower, etc.
- Share your ideas
- Have fun

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Teamwork Tips

- A bad team will build a bad robot
- Brainstorm
 - Don't hold back ideas
 - Don't squash ideas
 - Constructive conflicts are good

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Tips on Implementing Your Robot

- Division of labor
 - Specialist approach
 - Generalist approach
- Debugging
 - Will take longer than you think
 - Have your teammate debug your work
- Use Incremental Design
 - Boosts morale

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Tips for the Contest

- When making practice runs, don't "help" your robot
- Practice calibrating
 - Be aware of your proximity when calibrating
- The lighting conditions in 26-100 will differ from those in lab
- Develop a checklist of things to do for preparing your robot to compete
- Bring a repair kit
- Have fun

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Your Kit

- Worth >\$1K
- Not all components are ready yet.
- No trading of unequal parts!
 - Black Lego pegs and gray Lego pegs are different!
- Hawker Cells
 - Be careful with them!
 - Low internal resistance = high current

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Sensor Store & \$20 Electronics Rule

- 20 point allowance
- Use to "purchase" sensors and motors
- No refunds!

- Can also purchase sensors from outside sources using
- Must keep receipt of purchase explain reasons for using sensor

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Tool Store

- Purchase tools at a discount
 - Long Nose Needle Pliers \$3
 - 5" Cutters/Strippers \$3
 - Shear Cutter \$3
 - Soldering Iron \$9
 - Soldering Iron Stand \$3
 - Helping Hands \$4
 - Clear Plastic Parts Bin \$5
 - *Everything but parts bin* \$23 (save \$2)
- Accept cash & checks to MIT

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Things to do...

- Need to fill out the following forms:
 - Kit release/recitation form
 - Electrical safety form
- Recitations assignments will be e-mailed by tomorrow
- Lab will be open tonight from 7-9PM.
- Please check the contents of your kit

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Good Luck!



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Contestants

- Team 1
 - Mariano Alvira
 - Chijioke Emenike
- Team 2
 - Sasha Devore
 - Benjamin Morse
 - David Lowenfels
- Team 3
 - Jessica Forbess
 - Jeremy Braun
 - Kim Falinski
- Team 4
 - Albert Leija
 - Christopher Avrich
 - Nicholas White
- Team 5
 - Hiroyoshi Iwashima
 - Prasad Ramanan
 - Yao Li
- Team 6
 - Ian Finn
 - Liyan Guo
 - Stanley Hu
- Team 7
 - Nikos Michalakis
 - Daniel Vlastic
 - Spyridon Michalakis
- Team 8
 - Xixi D Moon
 - Zhenye Mei
 - Victor Yeung

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Contestants

- Team 9
 - Chuohao Yeo
 - Hiroki Kaido
 - Tsehsiang Teo
- Team 10
 - Justin Verdirame
 - Aaron Valade
 - John Rondoni
- Team 11
 - Jodi Beggs
 - Mitchell Berger
 - Alex Hochberger
- Team 12
 - James Goodman
 - Danny Fisher
 - Rocky Bryant
- Team 13
 - Yogishwar Maharaj
 - Anant Saraswat
 - Shastri Sandy
- Team 14
 - Jeffrey Tooley
 - Greg Dennis
- Team 15
 - Marcos Cordero
 - Craig Music
 - Salvador Ochoa
- Team 16
 - Brian Romo
 - Javier Lopez
 - James Wood

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Contestants

- Team 17
 - Ray Cheng
 - Winston Chang
- Team 18
 - Rujira Hongladaromp
 - Paisa Seeluangsawat
 - Pee Seeumpornpoj
- Team 19
 - Aaron Mihalik
 - Marisa Kirschbaum
 - Thomas Mack
- Team 20
 - Jacky Mallett
 - Chris McEniry
 - Constantine Christakas
- Team 21
 - Daniel Hu
 - Peter Agbah
 - Yu Chen
- Team 22
 - Jason Giff
 - David Lipsky
 - Chirs Leger
- Team 23
 - Neil Chungfat
 - Justin Lin
 - Roxanne Lau
- Team 24
 - Aaron Adler
 - John Hernandez
 - Nickolai Zeldovich

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Contestants

- Team 25
 - Matthew Seegmiller
 - Ehren Foss
 - Colin Crass
- Team 26
 - Joe Bingold
 - John Biesiadecki
- Team 27
 - Minnan Xu
 - Manuel Balderas
- Team 28
 - Nick Homer
 - Harry Portlock
 - Reid Andersen
- Team 29
 - Melissa Shi
 - Kai Huang
- Team 30
 - Joe Levine
 - Steve Park
 - Daniel Moon
- Team 31
 - Tuan Phan
 - Joseph Hasting
 - Lauren Bradford
- Team 32
 - Chad Keever
 - Julie Kaufman
 - Warit Wichakool

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Contestants

- Team 33
 - Shome Basu
 - Amit Goyal
 - Stefan Gromoll
- Team 34
 - Justin Schmidt
 - David Lee
 - Jonathan Lee
- Team 35
 - Justin Kuo
 - Bennett Landman
 - Che King Leo
- Team 36
 - Kevin Atkinson
 - Rich Redemske
- Team 37
 - Jeremy Silber
 - David Greenhouse
 - Jordan Adler
- Team 38
 - Beau Tateyama
 - I Hsiang Shu
 - Laura Curraa
- Team 39
 - Greg Kuhnien
 - Danny Jochelson
 - Gabor Csanyi
- Team 40
 - Ben Walter
 - Min Huang

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Contestants

- Team 41
 - Seth Purcell
 - Christopher Osborn
- Team 42
 - Rachel Lea Leventhal
 - Eva Jacobus
 - Sophia Yuditskaya
- Team 43
 - Jessica Huang
 - Eric Huang
 - Vincent Chen
- Team 44
 - Rhys Powell
 - Wes Chao
 - Ashwin Krishnamurthy
- Team 45
 - Jeff Hsing
 - Ryan Carlino
 - Risat Jannat
- Team 46
 - Madhulika Jain
 - Ben Chambers
 - Niko Matsakis
- Team 47
 - Mark Tompkins
 - Naveen Goela
 - Raj Dandage
- Team 48
 - Christopher Lesniewski-Laus
 - Jacob Strauss

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Contestants

- Team 49
 - Nick Bozard
 - Will Kaberle
 - Alice Enevoldsen
- Team 50
 - Kwame Green
 - William Lark Jr
 - Galen Barrett
- Team 51
 - Bryan Perryman
 - James Chen
 - Peter Finin
- Team 52
 - Ben Cooke
 - Edward George Essey
- Team 53
 - Max Van Kleek
 - Roger Nielson
 - Anne Thompson
- Team 54
 - Justin Weir
 - David Arguelles
 - Artie Michel
- Team 55
 - Eko Lisuwandi
 - Muhammad Kaimuddin
 - Melissa Miao
- Team 56
 - Meng-Jiao Wu
 - Jason Loy
 - Minhui Lee

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Contestants

- Team 57
 - Casey Muller
 - Audrey Snyder
 - Alea Teeters
- Team 58
 - Darius Jazayeri
 - Kevin Thompson
- Team 59
 - Omar Aftab
 - John Bender
 - Oguz Silahdar
- Team 60
 - Kin-Joe Sham
 - Eugene Chiu
 - Edmond Chou

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