Maslab: Syllabus, Rules, and Kit

Contents

- Organizational
  - Collect Checks
  - MIT numbers and T-shirt sizes
- Syllabus
- Rules
- Kit
- Resources

Syllabus

January 2012

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
						1
2	3	4	5	6	7	8
9 Lecture 1 Checkpoint 1	10 Lecture 2 Checkpoint 2	11 Lecture 3 Checkpoint 3	12 Lecture 4 Checkpoint 4	13 Checkpoint 5	14	15
16 Checkpoint 6	17 Checkpoint 7 Mock 1	18	19	20	21	22
23 Mock 2	24 Sponsor Dinner	25	26	27	28	29
30 Mock 3 Checkpoint 8	31 Seeding competition	1	2 Impoundment	3 Final Competition		

Lectures

- Lecture 1:
  - Introduction
  - Mechanical design and planning
  - Sensors and Actuators
  - Using the microcontroller
- Lecture 2:
  - Vision
  - Controls
  - Software Architecture and Threading
- Lecture 3:
  - Behaviors
  - Mapping and Localization
- Lecture 4:
  - Guest lecturer

Checkpoints

1. Hello World, Drive for x seconds
2. Strategy (Drawings)
3. IR/bump sensors
4. Turn and drive toward ball
5. Color calibration
6. Start on button press, stop after 3 min
7. Design checkpoint
8. Double check 6 (make sure it still starts and stops appropriately)

Class Requirements

- Attend lectures
- Write in team journal on the wiki
- Complete all 8 checkpoints
- Attend mock competitions
- Attend sponsor dinner
- Write 5-7 page paper at the end
- Attend Seeding and the Final Competition
- Complete team assignments*
- Do the majority of your work in lab

Team Assignments

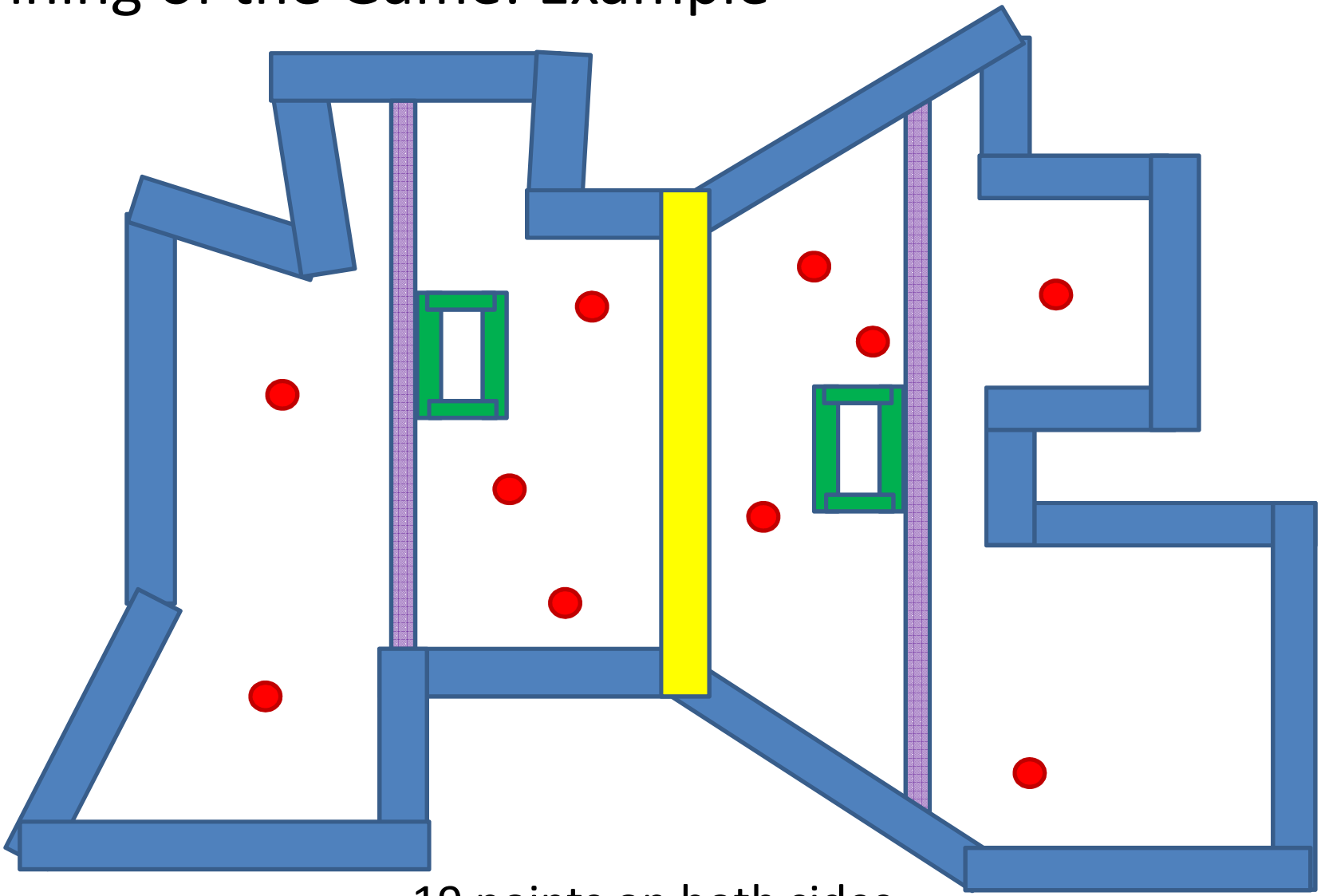
- Teams will be assigned to some of:
  - Lab cleanup
  - Mock Contest Setup
  - Mock Contest Teardown
  - Sponsor Dinner Setup
  - Sponsor Dinner Teardown
  - Contest Teardown

Rules

Rules: Overview

- 2 robots on the field, one on either side
- 3 min per run
- Totaling points:
  - Every ball between the yellow wall and the purple line: 3 points
  - Every ball in the box: 3 points (inaccessible to the other team)
  - Every ball past the purple line: 5 points

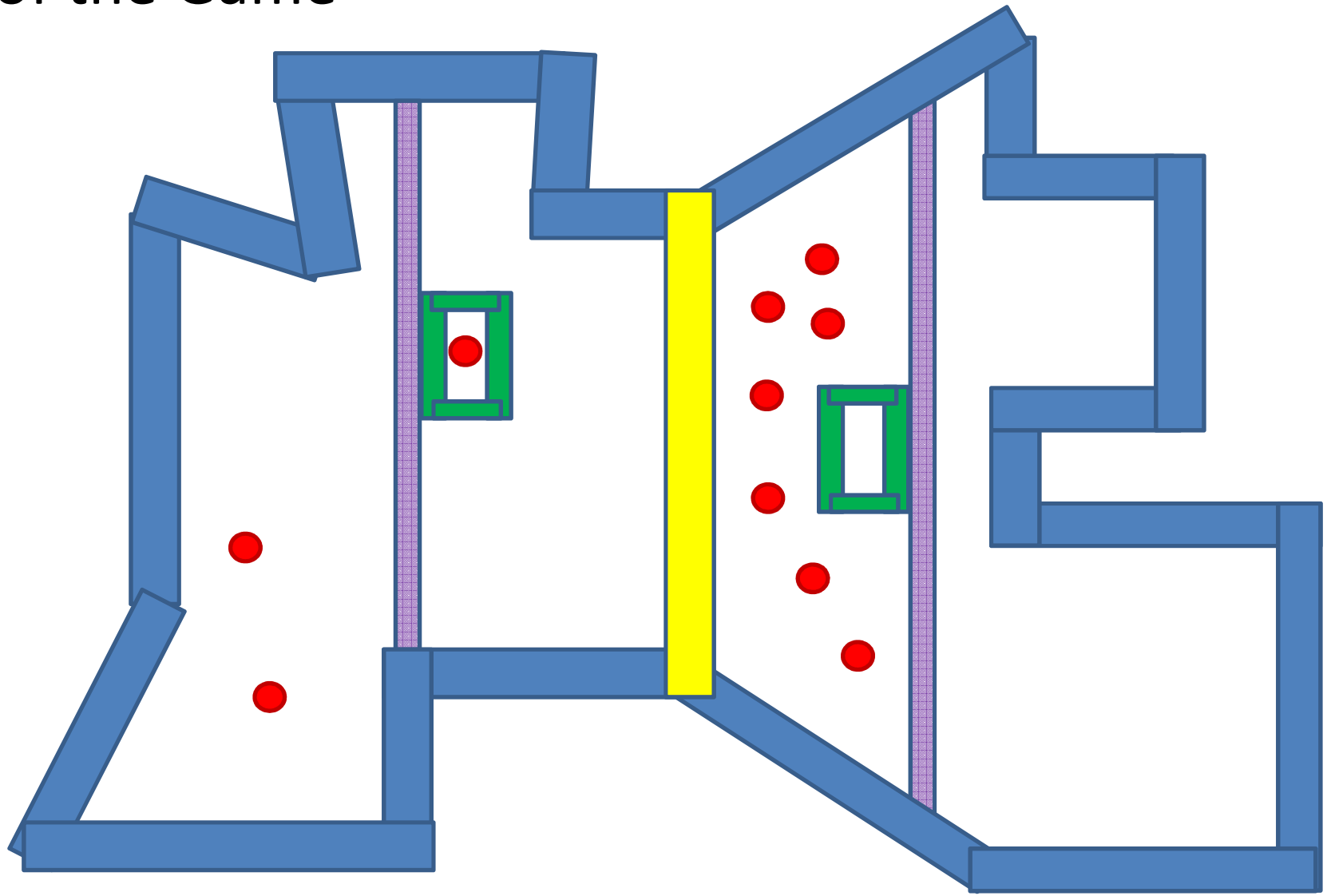
Beginning of the Game: Example



19 points on both sides

The purple line is not a wall, it is a strip of tape. All other lines are walls.

End of the Game



Left team: 21 points
(7 balls * 3 points)

Right team: 13 points
(2 balls * 5 points + 1 ball *3 points)

Rules: Points*

- 1 point possession
- 3 points for over the wall, or in the box
- 5 points for past the distance line
- -5 points for going out of bounds (and the ball gets put back on your side, in the deep zone)
- -5 for every 10 seconds you go over 3 min

***Subject to change between now and IAP, all students will be notified of changes**

Rules: Robot Requirements

- No touching the floor on the other side
- Launched balls should not go above 3 feet from the floor
- Robot must fit within 14”x14”
- Can spend up to $100 of your own money
- Can spend up to 30 “sensor points” with us
- Completely autonomous
- Must start at the push of a button
- Stop automatically at 3 min

Rules: Field Specifications*

- 6in high walls
- Normal walls: white with blue stripe on top
- Wall between halves: yellow with blue stripe on top
- Box color: green with blue stripe on top
- Ball color: red
- All corridors will be at least 16in wide
- Walls will not meet at less than a 45 degree angle
- The box will have capacity to fit all balls in play

***Subject to change between now and IAP, all students will be notified of changes**

Rules: Field Specifications cont'd

- We make no specific promises about the distance at which the distance line is placed, except that it is past the green box.
- The near side of the green box will be between 16in and 20in from the yellow wall (and essentially parallel).
- The green box will be at least 10in x 10in, inside.
- The shape of the field will change every time it is setup.

Ties

- In the event of a tie, it will be broken by:
  - Number of balls moved from their initial location
  - Highest seed score
  - Weight (lightest wins)

Final Competition Bracket*

Single Elimination
Winners of Mock 2, Mock 3, and Seeding get benefits

***Tentative**

Seeding

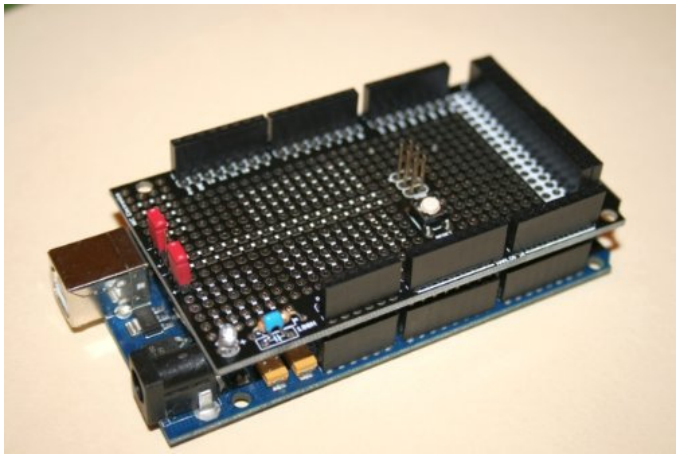
- Seed against stationary robot
- Ranking based on score
- Higher ranked play against lower ranked

Strategizing

- Go for speed (3 points, not in box)
  - Simpler mechanism (more time to debug)
  - Risk other team collecting
- Go for distance (5 points)
  - Risk other team collecting
  - A bit more mechanically risky
- Go for accuracy (3 points, in box)
  - More time consuming, but no risk of the ball being returned

Kit

Kit



- Asus eeePC 1015PX
- Arduino Mega 2560
- MEGAshield*
- 2 Motor kits (Trossen Robotics)
  - Motor: M-200-30-GHM-02
  - Wheels: M-400-30-T80P-394BO-HS4 (Blue)

*pre-assembled, with a few add-ons (motor controller, 5V regulator, etc)

Kit, continued

- Batteries and chargers
- Peg board
- Acrylic
- Camera
- Gyro

Also available

- Trade in sensor points for:
  - Servos (Futaba S3003, Power HD Standard Servo 6001HB, CS-80 Servo 2BB Giant Scale)
  - IR sensors
  - Accelerometers
  - Bump sensors
  - Another motor
- By request
  - Gears
  - Kinect***

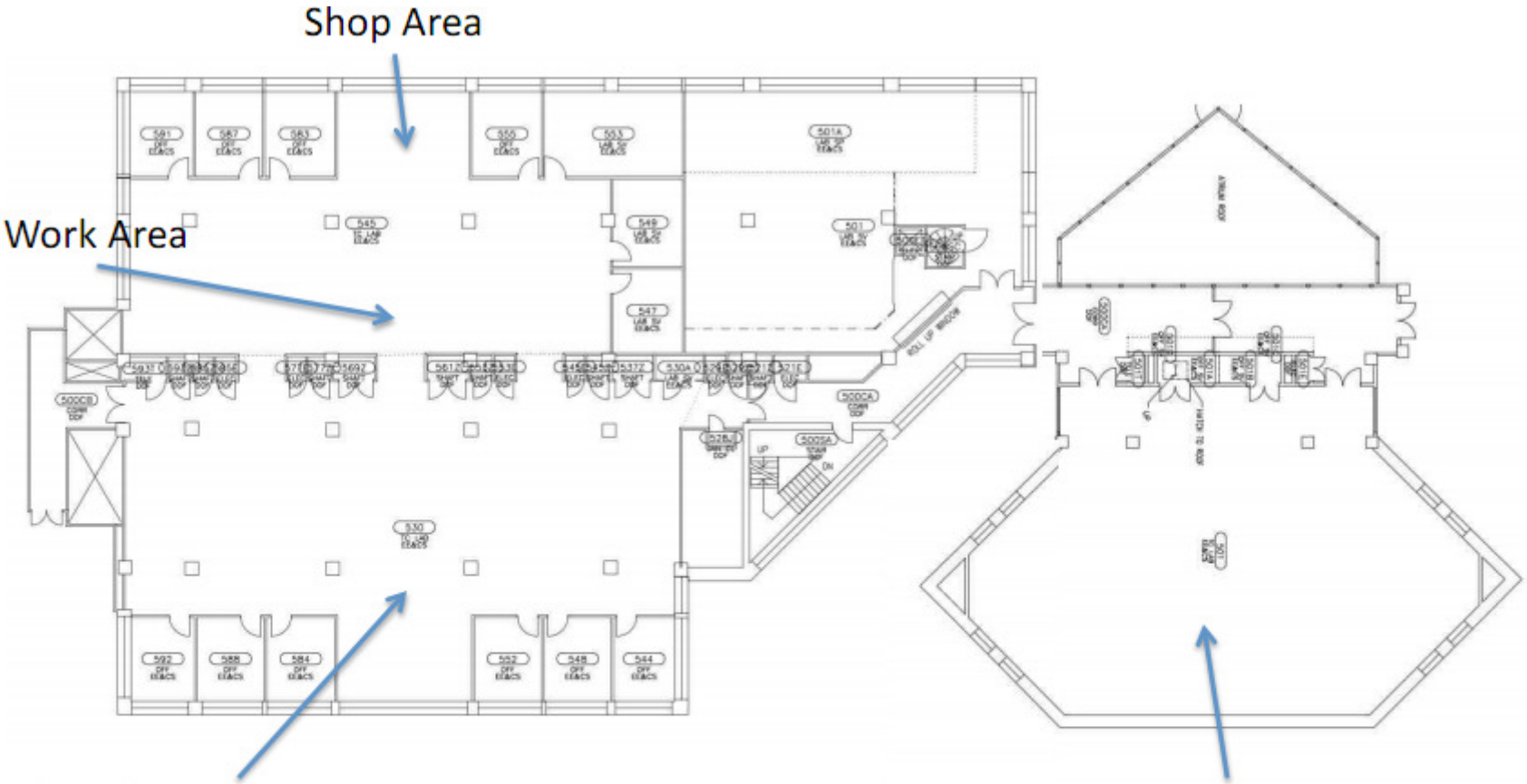
**Highly experimental, not supported by staff. Subject to a few restrictions (ie, we'll want to see progress in a few days, otherwise we'll encourage the regular camera)

Software

- Python is the primary language
- We provide:
  - Hardware interfacing libraries (camera, arduino)
- Will support another language if there is sufficient interest
  - It looks like Java may also be offered

Resources

Spaces



Building 38, 5th floor

Open noon-10pm weekdays

Building 34, 5th floor

Open 24 hours, no machining here!
Test field will be available here

Machining Areas

- Maslab Shop
  - Scroll saw, drill press, hand drills, shear, sheet metal bender, hand tools
- Edgerton Shop
  - One student from each team trained
  - Bandsaw, drill press, mill*, 3D printer
- Laser Cutter
  - Edgerton's has been having problems, so TBD
- Hobby Shop
  - Requires individual access

Before IAP

- Read past wikis
- Learn python
- Read up on machine vision
  - Will likely send tutorials out during winter break
- Learn Solidworks
  - CAD models of parts will be provided
- Consider strategy and design
  - Decide what parts beyond the kit you'll need