



GEAR Teacher Workshop 2012

Dr. Tanja Karp

*Associate Professor of Electrical and Computer Engineering
Texas Tech University*

January 21, 2012

Workshop Overview



- Overview of GEAR Events
- GEAR 2011 Challenge as Example of Robotics Tasks
- Hands-on LEGO Robotics
 - *NXT-G Programming Environment*
 - *Motion*
 - *Touch Sensor*
 - *Building and moving an arm*
 - *Solve some of the GEAR 2011 challenges*
- Distribution of LEGO Kits
- Introduction to Webinars (optional)



GEAR 2012: Power Up

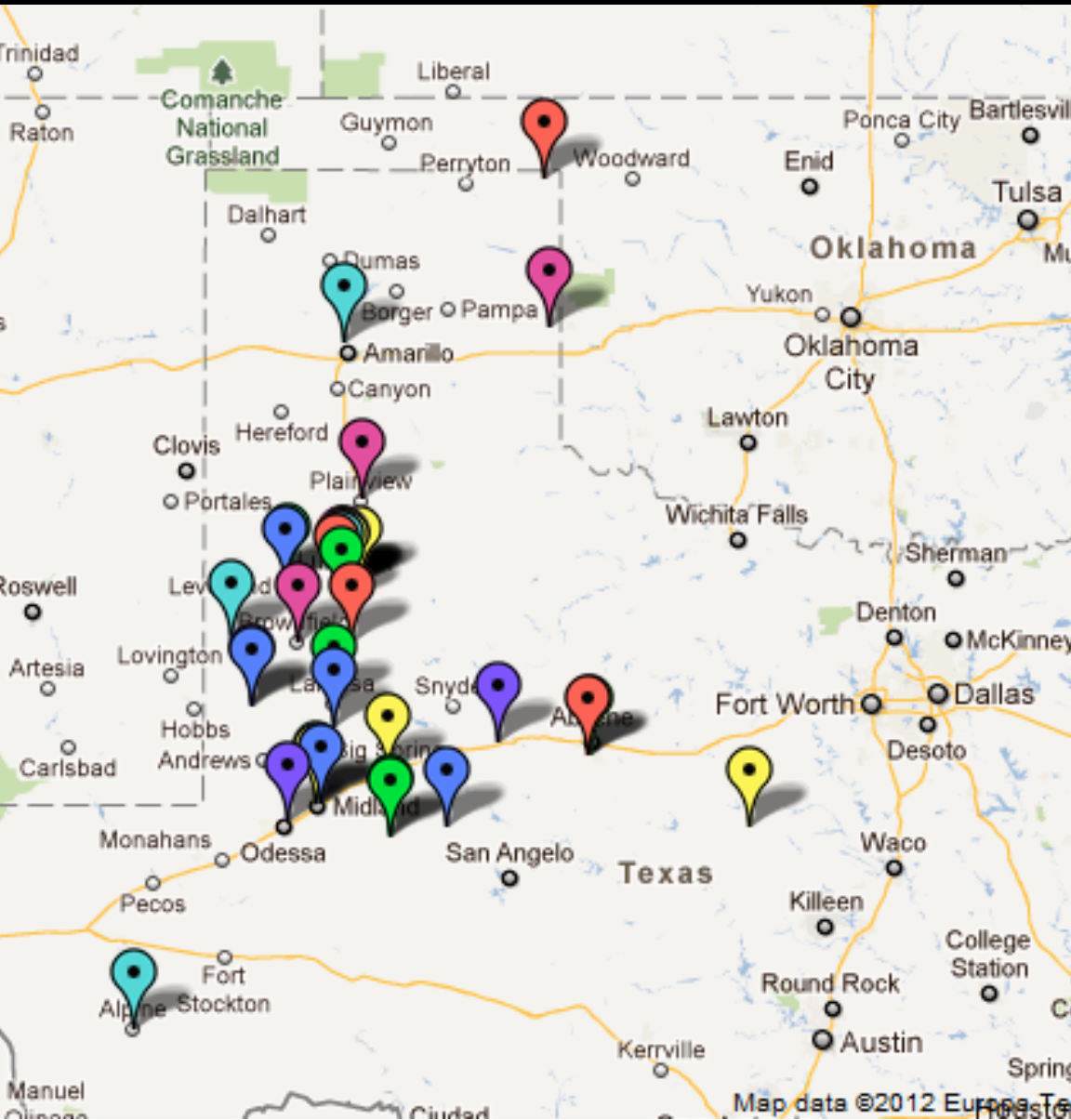
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April 2011



Participating Schools



21 Elementary
Schools (K-5)

22 Middle/Junior High
Schools (6-8)

Kickoff Event: February 25, 2-5 pm



- TTU, Biol Lecture Hall 110
- Invited Speaker
- Presentation of “Power Up” challenge
- Distribution of game pieces and mats (and LEGO kits)
- Hands-on engineering activity (split into smaller groups by school)



- Bring students and parents
- No food, drinks, money

Trial Run, March 24, 9 am – 3 pm



- TTU Recreational Center
- Elementary schools compete 9 am - 11:45 am
- Middle schools compete noon - 2:45 pm
- Practice runs under competition-like conditions
- Learn from other schools
- No ranking, awards, etc.
- I need to know the number of teams per school

Trial Run



- Wear sneakers
- Water-only facility
- Food can be eaten in upstairs lounge or outside
- Bring game mats and pieces to practice in-between matches
- Bring laptops with LEGO software installed and programs
- Bring enough adults to supervise your students!

Game Day, April 21, 9 am – 5 pm



- TTU Recreational Center
- Compete for Awards
- Elementary schools compete 9 am – 12:30 pm
- Middle schools compete 1 pm – 4:30 pm
- Seeding Rounds (all) and finals (best 8 teams)
- Dress up and be prepared to talk to judges



Game Day Pictures



Awards



- **1st - 4th Place Award** –first - fourth place at the end of the tournament.
- **Pinnacle Award** –highest single round score during the seeding competition.
- **Best Themed** –team that best reflects the theme of the contest.
- **GEAR Head Award** –robot exhibits creative use of available materials to implement an unusual machine capability.
- **Judge's Award** –team that is worthy of recognition
- **Most Elegant Robot** –robot makes the judges say, “WOW!”
- **Programming and Control Award**
- **Young Engineers Award (1st and 2nd place)**



ENGR 1315–S : Introduction to Engineering

- Service Learning Class during Spring 2012
- Students mentor GEAR teams in Lubbock (15 h)
- Students assist their teams at GEAR events on campus
- Students write essays about their learning experience at schools
- LEGO kits are used in class for engineering design, data collection and analysis projects, etc.





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GEAR 2011: TransFarmers, Rise of the FarmBots

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April 2011

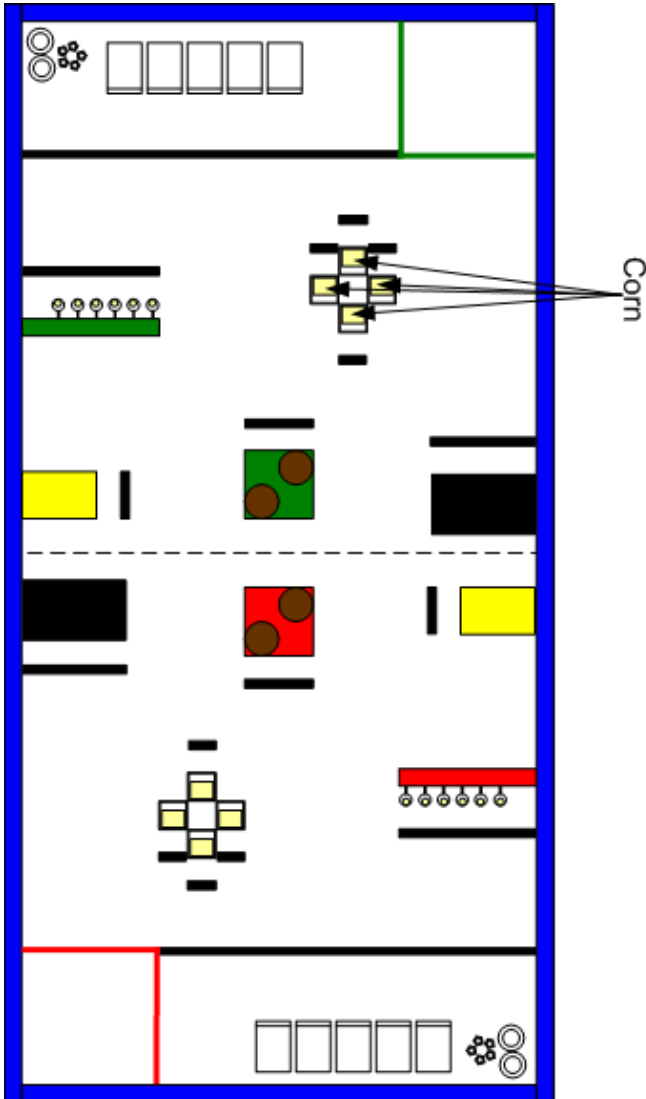
GEAR 2011 Challenge Objectives



- Harvest corn crop
- Harvest carrot crop
- Deliver corn to market
- Deliver cotton to market
- Clean the barn – remove manure container and deliver fresh hay
- Create alternative fuels
- Plant new crop

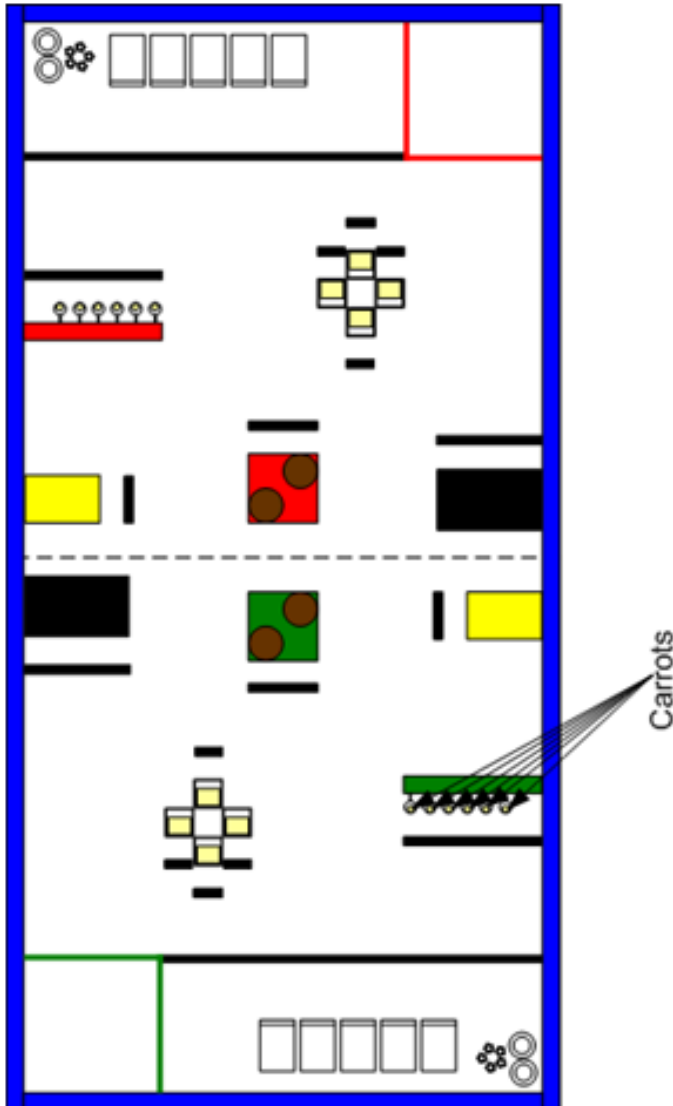


Harvest Corn



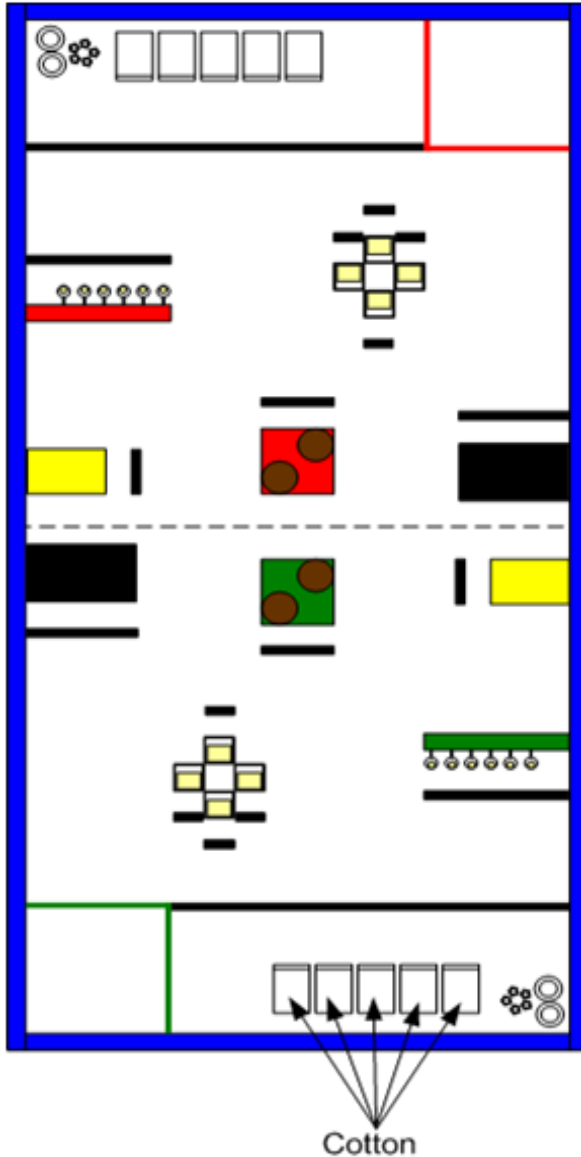
- Objective: Retrieve the corn bushels.
- Starting Location:
 - *Each corn bushel will be placed on a rubber pad. They should touch the edge of the rubber pad that is closest to the player zone.*
 - *The hooks should face towards the player zone.*
- Quantity: 4
- Scoring Rules:
 - *Each corn bushel must be in one of three places:*
 - Player zone
 - Market
 - Alternative fuels plant
- **10 points** for each corn bushel retrieved.

Harvest Carrots



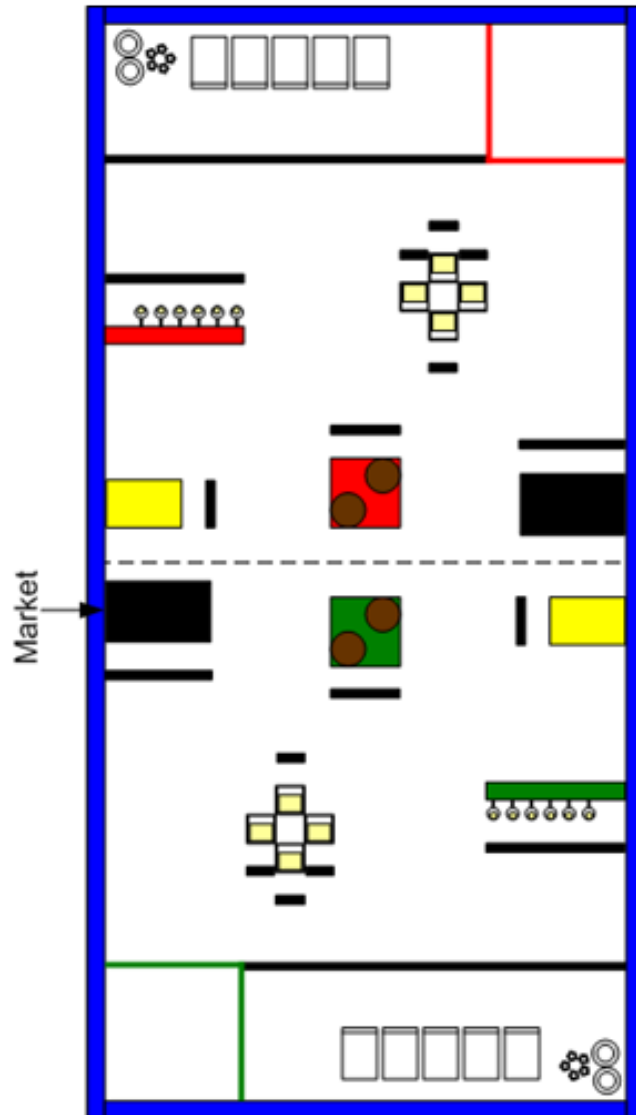
- Objective: Retrieve the carrots.
- Starting Location:
 - *Each carrot will be placed between the rings of the multi tool holder. The carrots should touch the upper ring and the bottoms should lay flat on the playing field surface.*
 - *The hooks should face towards the player zone.*
- Quantity: 6
- Scoring Rules:
 - *Each carrot must be in one of two places:*
 - Player zone
 - Market
- **15 points** for each carrot harvested

Cotton



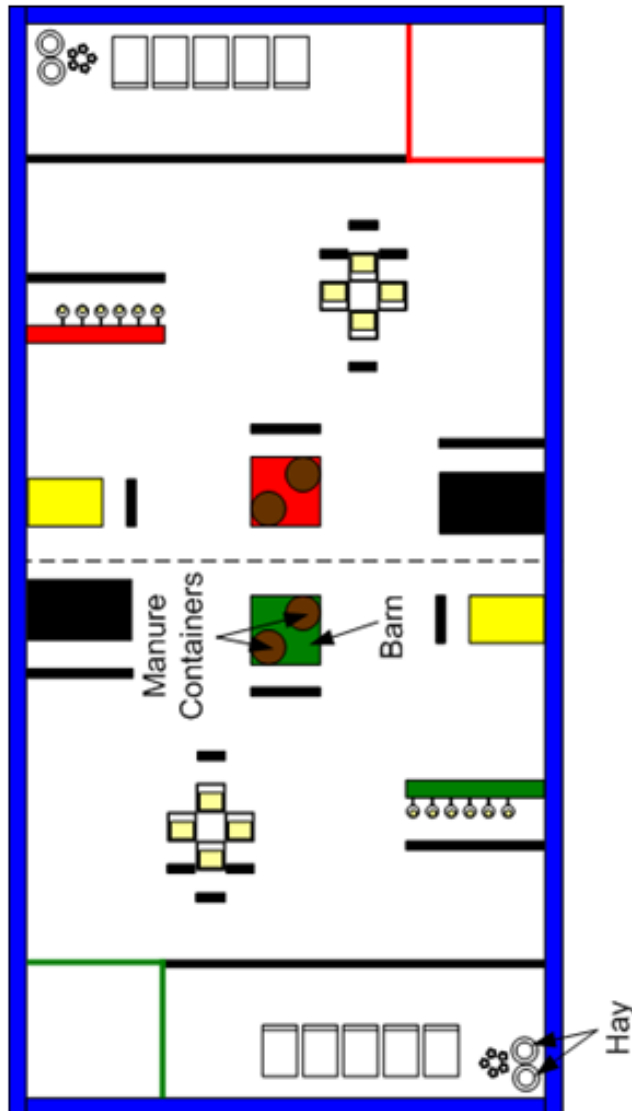
- Objective: Deliver cotton bales to market.
- Starting Location:
 - *Cotton bales will start in the in the player zone.*
- Quantity: 8
- Scoring Rules:
 - *Cotton bales left in the robot zone will not receive a score*
 - *Cotton bales that fall outside the playing field borders will be considered out of play and will not be returned to the field until the next match.*
- **5 points** for each cotton bale delivered to market

Market



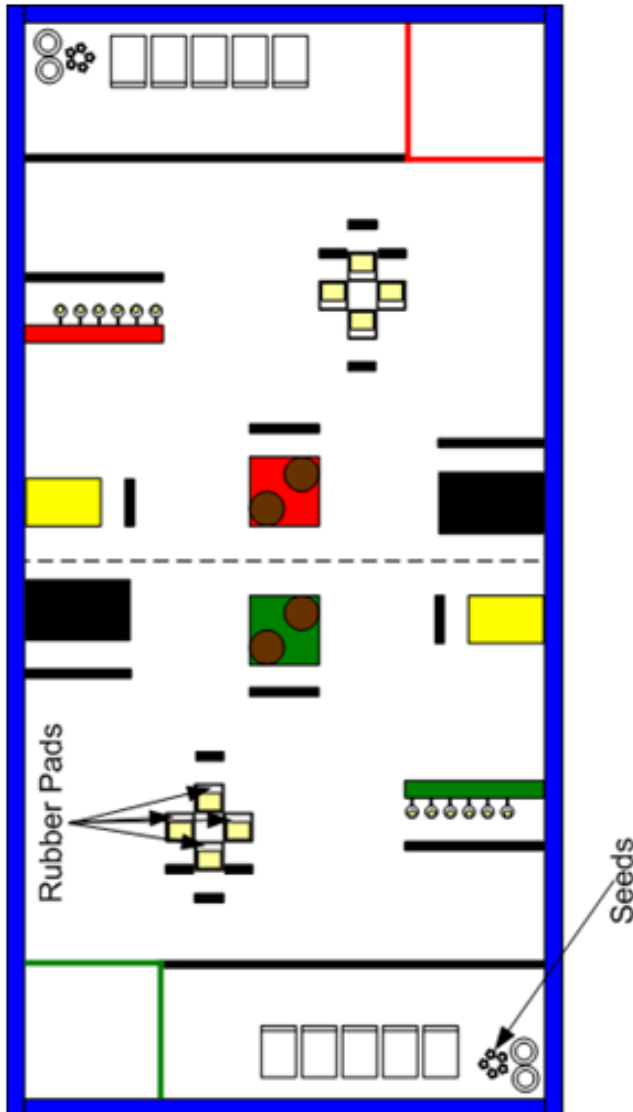
- Objective: Deliver corn or carrots to market.
- Starting Location:
 - *Player zone*
- Scoring Rules:
 - *Game elements that are touching the playing field surface, game field boundaries or touching the robot will not receive a score. The game elements may rest on the container border.*
 - *Robot attachments may be left behind; however the attachment must not touch the playing field surface or the field border.*
- Additional **10 points** for each corn bushel or carrot delivered to market

Clean the Barn



- Objective: Remove manure container and deliver fresh hay.
- Starting Location:
 - *Manure containers: in the barn.*
 - *Hay bales: player zone*
- Quantity: 2 hay bales and 2 manure containers
- Scoring Rules:
 - *Both manure containers **must** be removed prior to delivering the hay bales.*
 - *Each manure container must be in one of two places:*
 - Player zone
 - Alternative fuels plant
- **20 points** for each manure container removed from barn; **20 points** for each hay bale delivered to barn.

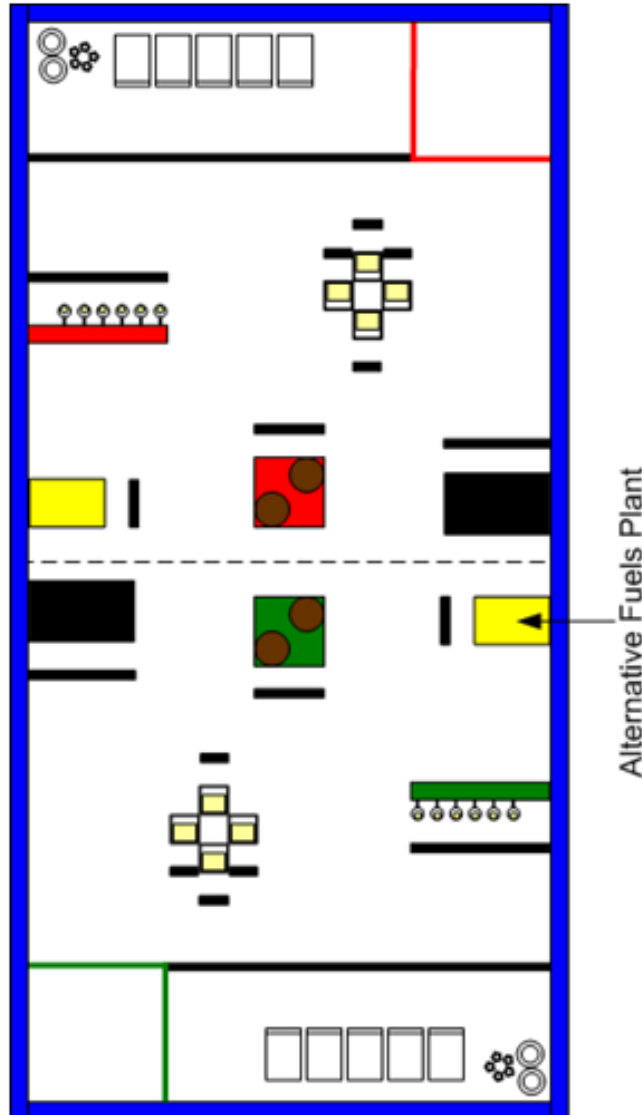
Plant New Crop



- Objective: Plant seeds in the field.
- Starting Location:
 - *Player zone*
- Quantity: 5
- Scoring Rules:
 - *The corn must be harvested prior to planting seeds*
 - *Max. 2 seeds will be permitted per rubber pad. (teams will only receive a score for 2 seeds if more than 2 seeds are placed on a rubber pad).*
 - *Seeds that touch the playing field surface will not receive a score*
- **10 points** for each seed delivered to a rubber pad.



Alternative Fuels Plant



- Objective: Deliver manure container or corn bushels.
- Starting Location:
 - *Player zone*
- Quantity: 5
- Scoring Rules:
 - *Manure Container: No part of the manure container may fall outside or overhang the walls of the alternative fuels plant.*
 - *Corn Bushel: There must be a matching corn bushel by an opposing team in their alternative fuels plant before points will be awarded.*
- Additional **30 points** for each manure container and corn bushel delivered to the plant.



General Game Rules and Penalties

Game Rules:

- Robots must fit in robot zone
- Robots can be moved/modified within player zone
- 1 robot per team
- 2 minute matches
- 5 seeding rounds, top 8 teams get to play 3 elimination rounds each (6 total), top 4 teams get to play 3 final rounds each

Penalties:

- 5 points for touching the robot in robot zone
- 5 points for delaying start of match
- 10 points for manually placing game piece in scoring area
- However, minimum score result per match is 0 points



General Game Rules

LEGO Kits:

- LEGO MINDSTORMS Education NXT Base Set 9797
- LEGO MINDSTORMS NXT 2.0 Retail Set 8547
- LEGO MINDSTORMS Education Resource Set 9648 or 9695



Check General Rules on other allowed materials



Benefits of GEAR (from Teachers)

- Teamwork, collaboration, meeting a deadline
- Critical thinking and problem solving
- Design, and problem solving skill building, engineering and programming experience
- Learning teamwork, compromise, trying until something works, hands-on learning, advanced problem solving
- Students get to see practical applications of science concepts
- Having a meaningful opportunity to create, design, build and program; learning self-discipline and using computers in an academic way

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