AC 2011-1458: KEYS TO SUCCESS IN THE IEEE HARDWARE COMPETITION

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Keys to Success in the IEEE Region 3 Student Hardware Competition

Abstract

Since the 1980's, IEEE Region 3 has had an annual conference, named SoutheastCon, that include student and professional programs. The student hardware competition is considered the central event within the student programs. It continues to maintain its original focus of the design and building of Robots that compete by performing a pre-defined task. Earlier names of this competition were solar car contest, "seeker" car and design contest. On the average about 49 of the 101 member universities participate in the student competition each year. Electrical engineering programs continue to take advantage of this contest with some using capstone senior design class students to form teams to participate in this competition. With the growing popularity of this contest, new methods and preparation is needed to increase the likelihood of student team success. These factors include advisor involvement, department/college/university support, student and local professional chapters support, multidisciplinary team creation, and underclassman involvement. The above list of contributing factors will be described in detail with data from past competitions validating the results. Some of the Key factors of successes include the different mentoring approach between the teams, how does each team perform in the COE senior design course, and the ability of team members to work well with each other.

Introduction

The University of North Carolina at Charlotte offers a two-semester, multidisciplinary senior design course that includes Mechanical Engineering, Civil Engineering, Electrical and Computer Engineering and Engineering Technology departments from the College of Engineering (COE). In these COE programs, practical design concepts are introduced in the freshmen year and built upon through the curriculum until students reach their senior year where they will be required to complete this two semester capstone senior design course. For the last five years, students participating in the IEEE hardware competitions are enrolled in the COE senior design course and receive the normal credit hours for the two semesters. These students go through the normal cycle of design development and follow the appropriate grading method using the standard rubrics as described in reference[1,3].

The COE senior design course is instructor lead with an oversight committee to insure students gain practical experience while utilizing the full design process in solving a relevant problem. The relevant problems originated from faculty, outside companies, or even competitions and contests from local or national organizations. Students select a project from a pool based on their interest and major; each student submits a resume and a cover letter to the instructor highlighting their personal interest. Each project has at least one advisor/mentor to assist the instructors with the selection and guide the team to accomplish the project goal. For the IEEE hardware competition senior design project, one faculty member who is currently an active member of the IEEE organization volunteers to advise and mentor the team. The mentor uses the latest rules for the hardware competition from the IEEE SoutheastCon website see reference[4] to build a statement of work (SOW) for a project to be completed around the competition time. All SOWs for industry and faculty projects are posted on a class website at the beginning of the first semester. Students apply for a project as if they were applying for a job. The instructors and

mentors review the applications and select the best applicants for each project based on discipline, technical knowledge and overall interest. For the IEEE Senior Design project, disciplines of interest were Electrical, Computer and Mechanical Engineering and at least one Engineering Technology student for practical applications experience. The combination of disciplines allow students to gain valued experience working on interdisciplinary team while tackling their problem: building an autonomous robot that is directly related to each discipline.

IEEE Region 3 Student Hardware Competition teams

This paper compares teams, based on their SOW, for work completed and the final results from each competition. As mention earlier, the faculty mentor generates a description of the work needed to complete the competition, provides guidance for appropriating funding and makes sure that the team is working within the scope of the deliverables. The teams receive the appropriate credit for the capstone senior design course.

Appendix A describes the scope of the current work being done for the 2011 IEEE Region 3 Hardware Competition. Two teams with three members were selected from a pool of twenty. Team A consists of an Electrical Engineering technology student and a Mechanical and Computer Engineering student. Team B consists of an Electrical Engineering technology student and an Electrical and Computer Engineer student. The strategy behind this year's team formation is based on the high number of students interested in the IEEE SOW, the prospect of at least one team meeting deliverables, or completion of robot, or possible merging of teams if needed. Having two teams doubled the fundraising efforts, increasing the overall funding support. Currently there are different faculty mentors for each team.

The SOW for the 2010 IEEE Region 3 Hardware competition is described in Appendix B. The team consisted of five students from a pool of twelve with three from the Engineering Technology (two Mechanical and one Electrical), an Electrical and a Computer Engineering student. This team was unsuccessful in meeting deliverables for the hardware competition; the robot was not operational for the competition or for the Senior Design Exposition.

Appendix C list the SOW used by students to compete in the 2009 IEEE Region 3 Hardware competition. Only four of twelve applicants for this project were accepted, with the members representing Electrical, Mechanical and Computer Engineering and Electrical Engineering technology. This team carried the work according to schedule, maintained engagement with faculty mentor, and finished high at the IEEE Hardware competition and won a local competition.

Appendix D list the SOW used by students to compete in the 2008 IEEE Region 3 Hardware competition "RFID on the moon" and Appendix E list the SOW used by students to compete in the 2007 IEEE Region 3 Hardware competition.

Team Deliverables during the first semester

All teams participating in COE senior design program are expected to produce industry-standard deliverables throughout the two-semester course. A leader, the "Principal Engineer", is identified

for each team to update all project documentation. During the first semester the design of the project should be completed and it should be described in the following documents:

1. Requirements and Capabilities
2. Planning (Work Breakdown Structure, and schedule for work events and financial project plan)
3. Mid semester status report with a power point presentation of a conceptual design (as described in paper[2])
4. Poster Presentation (should display the full design of the project and possible future implementation)
5. A complete design report

Each member of the team maintains an engineering notebook that includes enough detailed information about the project for another engineering group to pick up and duplicate. The financial project plan is followed by an actual transaction that exposes students to managing the complete design process. The Principal Engineer for each team also builds purchase orders for all parts needed for the project and submits it to the purchasing department through the mentor. Each team delegates roles to members, matching their backgrounds with tasks needed to complete the deliverables. The Senior Design IEEE hardware competition team works closely with the mentor and instructor. Unlike other COE design teams, IEEE teams must order parts early, preferably before the end of semester one, to maximize build and test times. A committee at the COE level evaluates the feasibility and completeness of the design prior to approving funding for parts. This funding must be matched by local IEEE chapter organization to be received. This process delays the ordering of parts until Christmas break. Figure 1 shows student from the IEEE hardware team building the robot in the first week of January for the 2008 competition.

Figure 1: Student building the robot for the IEEE 2008 Region 3 Hardware Competition

Figure 2 shows a student building part of the robot for the 2009 IEEE hardware competition in the last week of December at the end of semester one.

Figure 2: Student building parts for the IEEE 2009 Robot

Teams Deliverables during the second semester

The following is a list of deliverables that every senior design team should deliver in the second semester.

1. Five to six status reports that should describe the progress of the project
2. Initial prototype demo and a Power point presentation describing the prototype.
3. Poster Presentation
4. A final written Report describing the complete project

These deliverables in addition to the deliverables from semester one are described in full in an earlier papers[1,3]. Since the IEEE teams participate roughly a month earlier, the deliverables are also needed earlier to insure completeness of robot with accompanying paper for student paper competition.

The final prototype

The IEEE Region 3 Hardware Competition usually occurs in March or early April while the Senior Design Class ends the last week of April; therefore members of successful IEEE teams

complete the prototype at least three weeks ahead of the rest of the senior design teams. This was accomplished with the 2009 team. Figure 3 shows the actual robot in the 2009 hardware competition picking up cans and bottles from the playing field.

Figure 3: Robot in the 2009 IEEE Region 3 Hardware Competition

Rubric Used to Assess Team work motivates team to stay on target

Team deliverables will be evaluated according to pre-defined rubrics as described in earlier papers[1,3] . The deliverables and rubrics used to measure team's progress greatly impact the success of the Hardware completion by keeping the team on schedule and target. Utilizing industry-standards deliverables prepares students for future careers related to design. Table 1 provides a history of team's performance in competitions, while tables 2 and 3 show teams performance in class using the capstone course rubrics.

Table 1: History of the UNC Charlotte IEEE team performances

	March 2007	March 2008	March 2009	March 2010	March 2011
Theme	Basketball	Moon Surface	Pick up trash	Solar	Respond in natural disaster
Performance In the region 3 competition	Project did not run - did not enter competition	Team placed #12 out of 49	Team placed #9 out of 49	Team placed #40 out of 46	Team A placed #one out of 34
Performance In the COE competition	Project did not run	Project won first prize	Project won first prize	Project did not run	TBD

Table 2: IEEE team rubric evaluation during the course of the first semester

deliverable	March 2007	March 2008	March 2009	March 2010	March 2011
Elaborate on the Statement of work	N/A	N/A	N/A	Average (and late)	Excellent
Identify all Capability and requirement	Average	Excellent	Excellent	Average (and late)	Excellent
Planning and financial document	Average	Excellent	Excellent	Poor	Excellent
Conceptual design review	N/A	N/A	Excellent	Poor	Excellent
Engineering notebook	Poor	Excellent	Excellent	Average	Very well
Status report	N/A	Excellent	Very well	Below average	Very well
Peer evaluation	Average	Excellent	Excellent	Four students Very well one average	1st team Excellent 2nd team very well
Poster exposition	Below average	Excellent	Excellent	Below average	Very well
Final report	Poor	Excellent	Excellent	poor	Excellent

Table 3: IEEE teams rubric evaluation during the course of the 2nd semester

Deliverable	March 2007	March 2008	March 2009	March 2010	March 2011
Submit Purchase order on time	Late	Ahead of schedule	Ahead of schedule	Late	On time
Initial Prototype review	N/A	N/A	Excellent	Poor	Excellent
Engineering notebook	Poor	Excellent	Excellent	Poor	Excellent
Status report	Average	Excellent	Very well	Below average	Very well
Peer evaluation	Average	Excellent	Excellent	Very well	Average
Poster exposition	Below average	Excellent	Excellent	Below average	TBD
Final report	Poor	Excellent	Very well	Poor	TBD

Philosophy of an IEEE Robot Faculty Mentor for 2008 and 2009 teams

The hardware competition rules state that only undergraduate students are allowed to participate in the design, building, and testing of a robot. Therefore, the faculty mentor must maintain a fine line between simply advising and doing any work on the project. The mentor must ensure he/she does not create any designs but instead advises the group when a design has a medium to high probability of failure. Of course, the mentor should also assess designs and identify or suggest alternative technologies that could be helpful. This requires communication and engagement with the teams.

Based on prior experience, the philosophical mantra of mentoring has been, "keep it simple" and "if it works, don't fix it". Many students will add unnecessary functionality to a design that does not address any additional requirements. Further, students often complete the project as designed that meets all requirements, then start changing the device because they saw a better way to implement functionality - these changes rarely improve the project, and often incapacitate the entire device.

Future techniques that could improve the quality of students work

1. Early experience with other courses:
   Many Electrical and Computer Engineering, Mechanical Engineering and some Engineering Technology departments offers courses such as junior project, special topics and introduction to robotics or Mechatronics. The majority of these courses are electives, counting as a grade and used towards graduation. With instructor approval, these courses can be utilized in preparing students at least a semester in advance by requiring some level of design and build that can contribute to the deliverables for the current IEEE teams. Graded assignments/project representing needed task could be used to maintain student focus while building valuable practical experience that could be used for future IEEE Hardware teams.

2. Early experience with student organizations:
   Organizations such as Charlotte Area Robotics, IEEE Robotics and Automation Society, American Society of Mechanical Engineer and IEEE Student chapters provide a means for underclassmen to gain early experience allowing their knowledge of robotics to build until senior design, where they can apply this knowledge on the IEEE Hardware team. This exposure stems from building other robots or assisting the current IEEE hardware team.

Winning results from Hardware Competition at the 2011 IEEE Region 3 Conference

For the 2011 hardware competition two robot teams were entered, one in the main and the other in the open competition, since one team per IEEE Student branch is able to compete in each competition. The selection was made based on rubrics used from Senior Design and mentors' observations. This involved a monitoring of progress and moral of each team based off of peer evaluations until the time of registration of teams. Mentors offered advice to all members of the teams when a dip in results of peer evaluation occurred. All this contributed to the success in the

2011 Region 3 hardware competitions as illustrated in Figure 4 with the Hardware team receiving first place trophy and plaque from Awards Banquet. Figure 5 is the winning robot entered by the IEEE team in the competition.

Figure 4: Winning the First Place Trophy at the 2011 IEEE Region 3 Hardware Competition

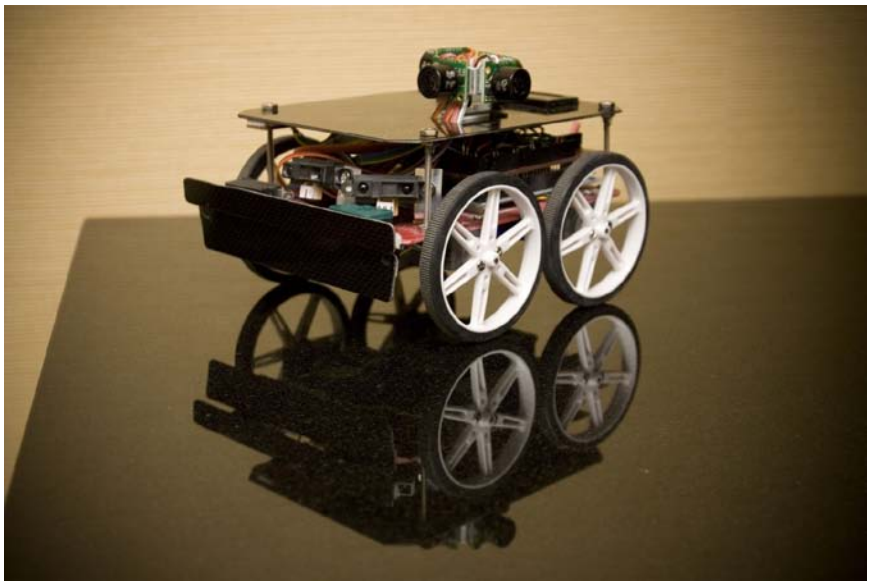

Figure 5: The winning Robot at the 2011 IEEE Region 3 Hardware Competition

Conclusions

The 2008 and 2009 hardware team finished well at SoutheastCon 2008 and 2009, respectively. The 2010 team did not perform well. Key factors include the mentoring approach between the teams, how each team completed the deliverables as specified by the COE senior design course and the ability of the team to delegate tasks based on member skill sets and interest. Each team utilized interdisciplinary teams and where bound by the same structure of the COE Senior design courses. The successful team benefited from an experienced mentor that followed the above stated philosophy and successfully completed the deliverables for the design course. The 2010 team had an inexperienced mentor that did not ascribe to the above mentioned mentoring philosophy and was marginal in completing the deliverables. Factors contributing to meeting deliverables include clearly defined roles and limited engagement by mentor. In the 2011 hardware competition, the mentors utilized previous years of experience as stated resulting in winning the competition.

References

1. James M. Conrad, Nabila Bousaba, Daniel Hoch, William Heybruck, Peter Schmidt, Martin Kane, Linda Thurman, and Deborah Sharer, "Assessing Senior Design Project Deliverables" Proceedings of the 2009 ASEE Conference, Austin, Texas, June 2009.

2. James M. Conrad, Nabila Bousaba, Daniel Hoch, William Heybruck, Peter Schmidt, Martin Kane, Linda Thurman, and Deborah Sharer, "Successes of an early conceptual design presentation for Senior Design Project " Proceedings of the 2010 ASEE Conference, Louisville, Kentucky, June 2010.

3. John K Estell and Juliet Hurtig, "Using Rubrics for the Assessment of Senior Design Projects", Proceedings of the 2006 ASEE Annual Conference & Exposition: Excellence in Education; Chicago, IL; USA; 18-21 June 2006.

4. IEEE Southeast con main website www.southeastcon.org

Appendix A

UNC Charlotte Senior Design Statement of Work Fall 2010-Spring 2011
Title: IEEE SoutheastCon 2011 Hardware Competition
Sponsor: UNC Charlotte
Faculty Mentor: Dr. Claude Hargrove/ Faculty Nan BouSaba
Personnel: EE/ECE/EET/MET
Expected person-hours: 250
Deadline: March 15, 2011 for Conference, May 2011 for Presentation
Sponsor Technical Representative: Dr. Claude Hargrove/ Faculty Nan BouSaba

Introduction
Natural disasters such as the 2004 and 2009 tsunamis as well as the most recent earthquakes on the island of Haiti and in Chile, motivates engineers to use modern technology to help save lives. The survival of human victims is strongly related to the amount of time required to respond to the victims; therefore, emergency responders need accurate, timely information about the scene. The theme of the SoutheastCon 2011 hardware competition is how autonomous robots can respond to natural disasters. Autonomous emergency response robots can safely evaluate the situation and relay vital information to emergency response teams.

Objective
The objective of this competition is to locate the victims trapped in a building, determine their status, sense hazards, and report this information to the emergency responders. The following information is known:

- Floor plan
- Types of obstacles which may be encountered
- Methods to locate victims and determine their health status
- Methods to sense hazards

Statement of Work: Project Overview and Motivation
Design and build an autonomous robot according to specs that will maneuver through a specified course to identify symbols of victims and their health status. This robot will be used in competition at SoutheastCon 2011 in the Hardware competition.

Project Benefits
Provides prospective in approach to rescuing victims trapped in buildings.

- Allows students to validate their education from UNCC College of Engineering, from practical application of concepts, to managing a project with a deadline, to work in a team environment establishing roles based in backgrounds and experience.
- Great opportunity for student visibility at conference that brings together 47 colleges and professions in Engineering representing the South East United States and Jamaica
- Valuable experience to use on resume and at an interview.
- Trip to Tennessee for SoutheastCon 2011 on March 31, 2011 to April 3, 2011.

Expectations of Students

- Positive Working Environment with the following defined roles: (All will work in all aspects of the robot design, build and, but these roles are for the leads)
  - embedded engineer – program embedded system used to operate robot
  - mechanical engineer/tech – design and draw robot, design mechanical system of robot
  - project manager – maintain and submit weekly report, prepare journal and presentation, schedule meetings, maintain budget of build
  - engineer engineer/tech – design electronics components, assemble and test robot
- Submission of weekly report that lists what was discussed, designed or accomplished and any cost incurred. A template will be provided.
- Full agreement by team on direction of project prior to start of build.
- Each team members must join Student Chapter of IEEE at UNCC to be able to participate at conference
- Submitted Student Paper of design at Conference with PowerPoint presentation and poster
- Availability to Attend IEEE SoutheastCon 2011 from March 31 2011 to April 3 2011 in Tennessee
- Full Participation of all members of team
- Allowed to work with members of IEEEs Hardware committee

Project Requirements:
Attached are the unofficial rules of Hardware Contest for SoutheastCon 2011. The final rules will be posted September 1, 2010 at the following link:
http://orgs.tntech.edu/ieee/SECON2011/rules.pdf.

Appendix B

IEEE SoutheastCon 2010 Hardware competition Statement of work:
UNC Charlotte **Senior Design Statement of Work Fall 2009**
Title: IEEE SoutheastCon 2010 Hardware Competition: Automated Solar Car Race.
Sponsor: IEEE UNC Charlotte Student Chapter
Faculty Mentor: Dr. Miri
Personnel: 3 EE/CpE/EET, 1 ME/MET.
Expected person-hours: 1000
Deadline: March 15 (Note: this is early since the completion is March 18)

Introduction:
Renewable energy is of increasing interest in today's society as oil and coal costs increase, and fuel sources become increasingly difficult to develop. Solar energy harvesting is an especially appealing renewable energy source as it generates little, if any, emissions. This project intends to develop a small autonomous vehicle that can negotiate a course with obstacles and is powered exclusively by solar panels.

Objective:
Vehicles must drive around a track as many times as possible within a time limit of three minutes in the presence of several different types of obstacles and terrains. To successfully complete the challenge, a vehicle needs to travel around the track, passing through/over obstacles. Points will be awarded for every lap successfully completed; however, bonus points will also be awarded to vehicles that successfully navigate one or all of the obstacles on a given lap.

The following key technologies will need to be integrated into the vehicle:

- Solar panel analysis and power harvesting
- Very-low power computing
- Efficient electrical to mechanical conversion and propulsion
- Problem solving, algorithm development, and course strategy

Playing Field:

The playing field will consist of a 10x10 foot square of AstroTurf that is ringed by wooden 2x4s. There will be a 4x4 foot wooden square in the center of the track to create the inside wall of the track and allow a 3 foot wide track. Adjacent to three of the outside walls, obstacles will be placed:

- Height Obstacle: Consists of a 2x4 structure with the inside dimensions of 16"wide by 8" tall.
- Width Obstacle: Consists of a 2x4 structure with the inside dimensions of 8" wide by 16" tall.
- Ramp Obstacle: Consists of a 16" wide Plexiglas ramp with 3faces, each 12" long, with the front and back faces at an angle of 30 degrees between the floor and the top surface.

The starting line will also host a "basking light" which will be an intense light that can charge the vehicle's solar-cells if needed.

Under the track will be an electric dog fence wire driven by the circuit that was used in last year's IEEE hardware competition. This wire will roughly run along the center of the track and be laid under the inner-most edge of each obstacle.

Along each side of the track at a level of 18” above the Astroturf, a fluorescent lighting system will be hung for energy harvesting. The four lights will be situated in the centers of the playing field on each side. They will each consist of a 4’ long tube without reflector.

Other awards will be given out to acknowledge outstanding achievement in the following areas:
-Most aesthetically pleasing
-Most entertaining
-Best mechanical design/implementation and best electrical design/implementation

Job Descriptions:
Each position below lists certain skills needed for the project. Please indicate which position interests you in your cover letter. Make sure you address your skills and how they map to the requirements below.
Software Engineer (2): This position requires a solid background in embedded systems and software development. The person in this position is expected to know the C programming language and basic computer architecture. Knowledge of Linux and VHDL is helpful but not necessary. This person will program the microprocessors to use the hardware developed by team members.
Hardware Engineer (1): This position requires a solid background in developing electronic systems using skills learned as a junior, including analog and digital circuits. This person must also have additional novice knowledge of analog-to-digital and digital-to-analog conversion and computer hardware.
Mechanical Engineer (1): This position requires a solid background in mechanical design.

Appendix C

IEEE SoutheastCon 2009 Hardware competition "Trash-collecting Robot" Statement of work
Title: IEEE SoutheastCon 2009 Hardware Competition: Trash-collecting Robot.
Sponsor: IEEE UNC Charlotte Student Chapter
Faculty Mentor: Dr. James Conrad
Personnel: 3 EE/CpE/EET, 1 ME/MET.
Expected person-hours: 1000
Deadline: March 1 (Note: this is early since the completion is March 5)

Introduction (From: http://hardware.gt-ieee.org/southeastcon2009/)
Athletic stadiums and college campuses are plagued by the issue of trash after tailgating parties. This is both unsightly and time consuming to clean up, and represents a potentially significant source of untapped recyclable materials. By developing an autonomous robot that can locate, sort, and separately store the different containers, the manpower needed for cleaning can be reduced. After most tailgating events, there is often an assortment of glass, plastic, and aluminum beverage containers, all of which can be easily recycled.

Objective
Robots must locate, obtain, sort, and store used beverage products. All sorting and storage is to be done on the robot. Points are awarded for the collected objects at the end of the round. Some points will be awarded for unsorted items; however, more points will be awarded for correctly sorted items. The winners will be judged on points with run time being the tiebreaker.
The playing field is a 10'x10' square made of green Astroturf with an "invisible dog fence" perimeter, under the Astroturf, that acts as the boundary. The dog fence transmitter kit will be provided upon registration. A 1-foot grid of small spray-painted green dots will indicate potential locations for recyclables. Each recyclable will be placed on a green dot. The integrity or visibility of the dots will not be guaranteed and is not intended as a navigational aid. There will be 10 total recyclables in play; 5 aluminum cans, 3 plastic bottles, 2 glass bottles.
The robot must be able to fit in a 12x12x18 45 inch (LxWxH) box at the start of each match. After the beginning of the round, expansion is unrestricted, but nothing can touch the playing field outside the 12"x12" footprint. The robot does not have to return to its original size. The robot must traverse the play field and gather cans and bottles. Points will be awarded for everything picked up with additional points for correct sorting. The playing time will be 4 minutes.
Other awards will be given out to acknowledge outstanding achievement in the following areas:
* Most aesthetically pleasing
* Most entertaining

* Best use of recyclable/recycled materials
* Best mechanical design/implementation
* Best electrical design/implementation

Appendix D

Title: IEEE SoutheastCon 2008 Hardware Competition: RFID on the Moon
Sponsor: IEEE UNC Charlotte Student Chapter
Faculty Mentor: Dr. James Conrad
Personnel: 4 EE/CPE/EET, 1 ME/MET. Expected person-hours: 1250
Deadline: March 27 (Note: this is early since the completion is April 3)
From: http://ewh.ieee.org/reg/3/secon/08/competition.html Reference D1.
The central theme for IEEE Southeast Conference 2008 Student Hardware Competition will be "Return to the Moon".

Objective
To find, retrieve and return to home base the 2-inch cubes (wooden blocks with attached RFID tags) within the competition time limit of six minutes. The block point values are determined by their color and numbers encoded on attached RFID tags.
Introduction:
In the not-too-distance future, mankind has returned to the moon, whereupon valuable mineral deposits have been discovered. Exploration and development of this resource has been licensed to private enterprises. Many organizations, perhaps yours, have decided to enter into a competition to harvest the mineral deposits and return them to Earth. The process is arduous and expensive, and international regulations only permit unmanned, autonomous prospecting robots on the moon. The color and magnetic properties of the mineral deposits are correlated with their worth. Good luck in your venture.
The robot must operate completely autonomously once started and be entirely self contained, including any power source. The maximum size is 10 inches by 10 inches by 11 inches tall.
The playing field will be based on a 6-foot by 6-foot plywood deck surrounded by walls that extend 8-inches above the playing field surface. The playing field will contain seven wooden blocks 2" on each side. Each block will have a round, passive RFID tag attached to one surface and the block will be painted according to its point value, see figure appendix D-1 of the playing field. The surface of the playing field will have gravel.

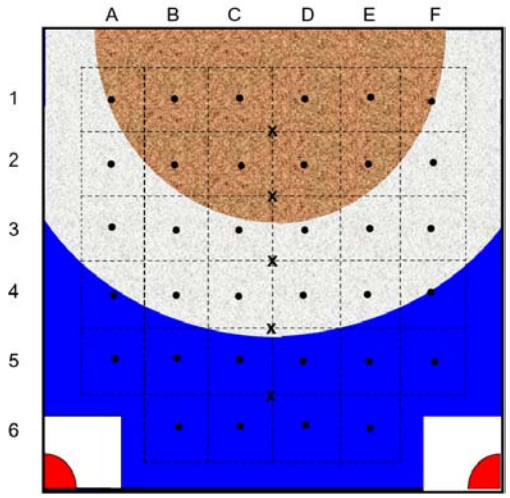

Figure appendix D-1 of the playing field (from reference[D1)].

Appendix E

Title: IEEE SoutheastCon 2007 Hardware Competition: Basketball
Sponsor: IEEE UNC Charlotte Student Chapter
Faculty Mentor: Alan Hege
Personnel: 3 EE/CPE/EET, 1 ME/MET.
Expected person-hours: 1000
Deadline: March 15 (Note: this is early since the completion is March 22)

Statement of Work From:
http://www.southeastcon.org/2007/doc/IEEE%20SoutheastCon%202007%20Preliminary%20Hardware%20Rules.pdf Reference E1.
Final rule posted on:
http://www.southeastcon.org/2007/doc/SoutheastCon_2007_Hardware_Rules.pdf

The central theme for IEEE Southeast Conference 2007 Student Hardware Competition will be basketball. This is an interactive competition and the theme goes along with March Madness. The competition will be a modified version of basketball played between two robots and the winning team will proceed to the next round of competition. The competition will require numerous engineering skills: circuits, machinery, electronics, power systems, microprocessors, and the dynamics of systems. Figure appendix E-1 show the playing court.
The robot can be 12" x 12" x 12" and can extend 6" in any one direction after leaving the starting point.

This will be a double elimination competition with each round lasting five minutes. Each robot will start the round on the side of the court where the hoop of that robot is located. Each robot will be allowed to have three balls in its possession for early scoring. The court will be divided into two halves with a wall, which would serve as a common ball hopper between the two robots. From that location the robot should:

1. Travel towards mid-court and shoot the three balls in possession.
2. Travel to hopper containing balls (along half court) (details on hopper to follow)
3. Pick up a maximum of three balls at a time
4. Shoot the three balls at the hoop in an attempt to make the highest score possible.
5. Return to step three until five minutes have elapsed and the round has ended or the balls in the hopper have run out.

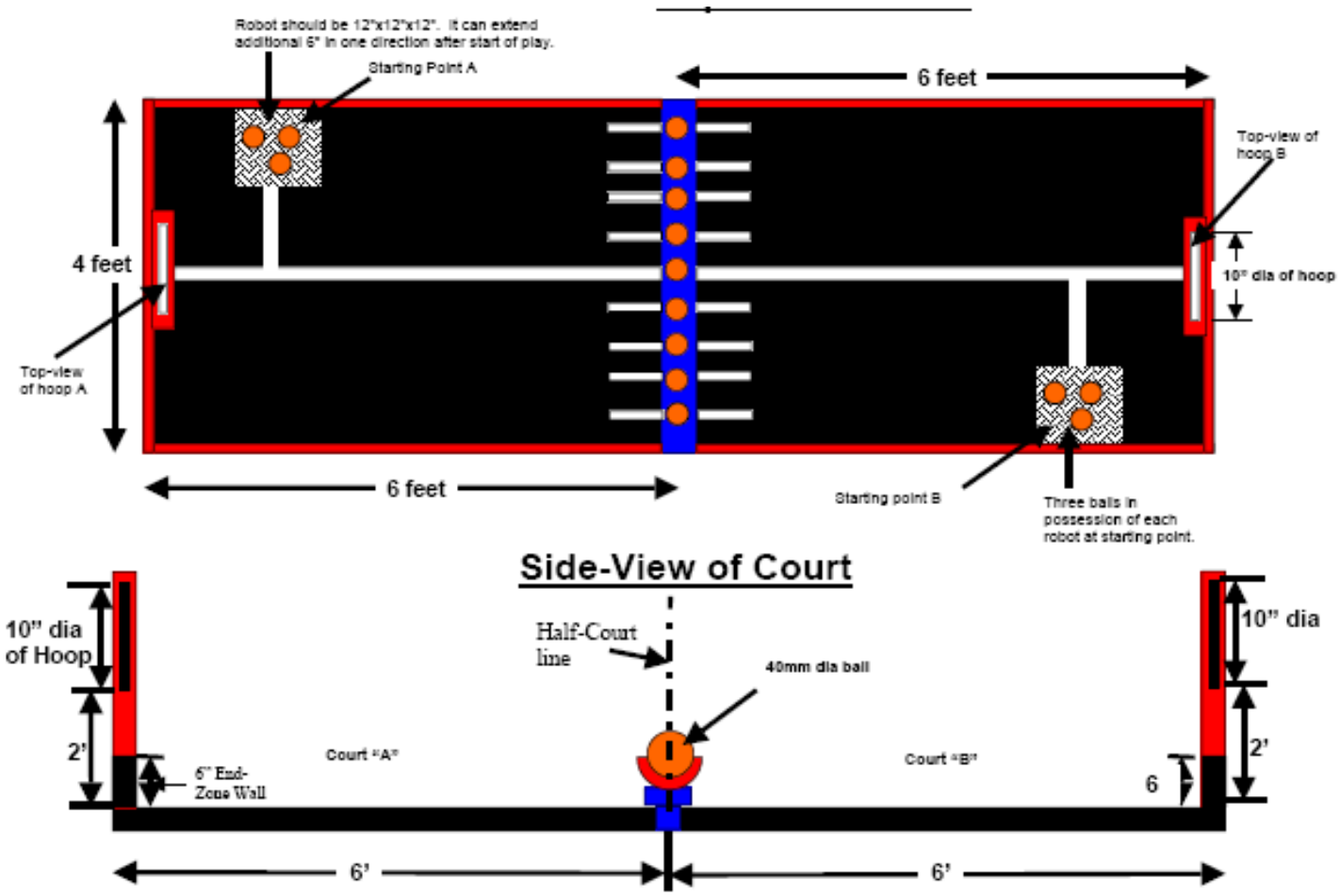

Figure appendix E-1, Playing court (from reference[E1)].