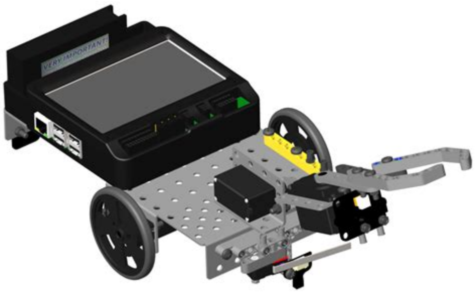
botball programming manual



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Book Descriptions:

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It assumes you can download the programming environment from the Botball website without further instruction, but is meant for a novice at programming in C. It provides brief instructions on how to build a demo robot and building a sensor bumper for experiments with the code, but otherwise this site is about programming and the KISSC Integrated Development Environment. Program Your Robot assumes you can find other sources for guidance in physical robot construction. Comments will be enabled so that students and teachers may contribute to the material and conversation about Botball, Robotics, Engineering, and Programming. Most assignments can also be tried with the older “XBC” controller using IC, also a free download from the Botball website, or you can try them using a Mindstorms kit and NXC, available on the web. Check their website for help. A few functions have been renamed; check with 2016 workshop slides. Terry Notify me of new posts via email. Each arena will need a different code to do well. Once you have programmed a robot How quickly your robot completes the challenge You will also be able to sell your robots once they have Enter a name for your robot and level of difficulty. If this is your first time in the workshop, we suggest you try the basic bot until This is where When you click on a command button, code is entered into the chat box. If you want to add the command By using the above commands and theThis function scans for the object and returns the angle between Have fun! If you have a question that is not addressed below, please contact us here. The cost to build a game board is kept to a minimum and detailed instructions are provided at the workshop. All parts are standard items available at most home improvement stores. Teams meet at least 2 times per week for several hours and many teams meet as often as possible during the build period.http://fresh-j.info/images/uploadedimages/coral-flexicom-200-manual(1).xml

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Every game is structured with multiple scoring objectives, allowing teams to focus on harder goals or simpler solutions. Read more here. You do not have to be an engineer or computer programmer. Adults are encouraged to mentor, but are not allowed to work on or program the robots. All payments must be received in full one week prior to the workshop. If you notify KISS Institute that you wish to withdraw from the program at least two weeks in advance of the workshop, your team is relieved of all financial obligation. Teams who have already paid will be refunded in full. If you notify KISS Institute that you wish to withdraw from the program within the two weeks prior to the workshop or after the workshop date, your team will be subject to a late withdrawal fee of 10% of the registration fee to cover the cost of shipping and restocking your teams equipment. If you notify KISS Institute that you wish to withdraw from the program after attending the workshop, your team is responsible for the entire registration fee. Photos will be taken during the workshop, tournament, and Global Conference on Educational Robotics. Photographs may be used in publications or other media material produced, used, or contracted by KISS Institute. Any person desiring not to have their photo taken or distributed must contact KISS Institutes Public Outreach Coordinator in writing stating their preference and include a photograph. The photo will be used for identification purposes and will be held in confidentiality by the Public Outreach Coordinator. Returning teams can choose to reuse previous equipment in exchange for a discounted registration cost. To see the equipment to reuse and reduction in costs, refer to the registration form. Teams have the opportunity to replace broken or damaged kit parts during the Teacher Workshop at no charge. Kit Shipment. Should a returning team elect not to attend the workshop, KISS Institute will ship the kit to your school after the workshop.http://sewakendragroup.com/userfiles/coral-flexicom-manual.xml

Full registration payment and shipping fees must be received prior to shipment.KISS Institute for Practical Robotics is a 501c3 nonprofit organization. All may not be used in any manner or for any purpose without the express written consent of KISS Institute for Practical Robotics. The KISS Institute Botball kit has found use in many classes at a number of universities. This paper outlines how the kit is used in a few of these different classes at a couple of different universities. This paper also introduces the Collegiate Botball Challenge, and how it can be used as a class project. Download fulltext PDF The KISS Institute Botball kit has found use in many classes at a number of universities. This paper also introduces the Collegiate Botball Challenge, and how it can be used as a class project. 1 Introduction Introductory engineering courses are used to teach general principles while introducing the students to all of the engineering disciplines. Robotics, as a multidisciplinary application can be an ideal subject for projects that stress the different engineering fields. A major consideration in establishing a robotics course emphasizing mobile robots is the type of handson laboratory experience that will be incorporated into the course of instruction. Most electrical engineering schools lack the machine shops and expertise needed to create the mechanical aspects of a robot system. Most mechanical engineering schools lack the electronics labs and expertise needed for the actuation, sensing and computational aspects required to support robotics work. The situation is even more dire for most computer science schools. Computer science departments typically do not have the support culture for the kind of laboratories that are more typically associated with engineering programs. On the other hand, it is recognized that computer science students need courses which provide closer to real world experiences via representative handson exercises.

This need is usually addressed in the context of software, but it also pertains to topics more closely linked to physical hardware, which certainly characterizes robotics. What is needed is a robot prototyping system that requires a minimum of support infrastructure, but has the depth and flexibility to allow serious engineering to take place. The Botball kit was originally designed for use in high schools, and requires no tools except for a computer and an occasional application of hot glue to speed assembly. The kit is being used in over thirty colleges and universities in at least four countries. The remainder of the paper describes the kit and how it is being used in a couple of different schools in different disciplines to teach different aspects of engineering. We will also describe some of the motivations both for using this kit and for having students work on robotic projects as motivating and educational factor. Cross compatibility between the Handy Board and RCX environment is maintained where reasonable e.g., at the hardware level, the DC motors, whether LEGO or modified servos, work for both environments. Programming is accomplished via a host PC using Interactive C, 4.3 which is included on the support CD. Interactive C, which originated with the MIT 6.270 Contest extends C syntax to include limited capability for initiating and managing concurrent processes, thus facilitating implementation of robotic paradigms such as subsumption. Technically, IC compiles to Pcode. The IC environment manages the interface between PC and processor board, including download of firmware the Pcode interpreter. Sensors and ports on the processor board are usually controlled via C library functions supporting the processor board being used, the executables for which are automatically downloaded to the processor board by the IC environment at initialization. Interactive C IC 4.3, which is the property of KIPR, is offered as freeware through the KIPR web site. IC 4.

https://skazkina.com/ru/3m-s10-lcd-projector-manual

3 supports both the Handy Board and RCX, and can be run from any one of MS Windows W95 on, MAC OSX and earlier MACs, and Linux. The Botball kit has evolved over time, with earlier versions used for robot building labs at the annual AAAI convention. The kit is currently available via KIPR’s

web site store. It also needs to be noted that the Handy Board distributed with the Botball kit is an extension of the original MIT design, incorporating an expansion board to facilitate the use of servo motors and for sending digital signals to external devices. Other minor modifications have been made to the board to facilitate the use of optical range sensors. The interface for IC 4.3 is a recent creation of Randy Sargent, who continues to be the primary developer for IC. The interface window utilizes tabbed frames, one of which is an interaction window for directly executing functions on the processor board. A tabbed frame is created for each new source file the user initiates or loads. Source code is automatically indented on load or on entry. The interface provides very thorough online documentation, and reasonable source code entry capabilities, including colorizing of text according to category. A suitably large font for class display is among the options. An upload capability is provided for capturing global data arrays generated during robot operation. The data capture is in text format with options for direct import into an analysis tool such as Excel. Pictorial instructions facilitate establishing a working link between PC and processor board, but debugging support otherwise is minimal. At present only a serial interface is supported, which may require purchase of a USB to serial adapter for newer PCs. MLCAD includes renditions of almost all LEGO parts that have ever been manufactured. In some respects the package is rough around the edges, but it is quite effective for documenting constructions and producing step by step renditions of constructions.

As an example, a fundamental demobot base unit constructed from LEGO Technic as rendered in MLCAD is shown in Figure 1. MLCAD also provides parts lists for constructions; e.g., Figure 1. Demobot base unit For example, if the base unit in Figure 1 is added to the MLCAD parts list, then it is a small matter to add treads or wheels from within MLCAD to obtain constructions as illustrated in Figure 3. 3 Robots for Introduction to Engineering 3.1 Ov erview For the past three years at the University of Oklahoma, we have merged the Engineering Computing and Introduction to Engineering courses in some sections. These merged courses have used a version of the Botball robot kit as the major tool for teaching computer skills, the design process, project organization, and general engineering techniques. The class meets in two 2hour sessions per week allowing adequate time for both lecture and inclass handson work. They are then tasked to develop a product idea, form engineering groups to develop various portions of the product and then prototype the system. Figure 3. Demobot variations with Handy Board They had to decide on a product idea that could be prototyped with the kit. The more difficult task was to come to agreement on what that product idea would be. A typical example of a project that would arise from the class was an automated party photographer. This was a robot that would wander around a room, and when it got near a person, it would back off a bit and tape a snapshot. The memberships of the groups changed throughout the semester. On the first project the teams were selected based on the instructor’s choice to try and spread people around so that every group had someone with programming experience and that students who had expressed interest in the different fields of engineering were mixed up, rather than putting all of one type together in a single group. In the second project each student made a list of the top five people they wished to work with.

The groups were formed to try and match as many of those requests as possible. For the final project, there were four different projects to choose from, and different roles for each of the projects. The students used an online bidding and registration system to apply for the project and position they wanted. They could also view else had received assignments, and then relinquish their position and apply for another if they wished. After a day, all the positions were locked into place. Throughout the term, three major projects were given where complete robot systems must be designed, built and programmed. The first project was a relay race where a series of two robots race between two stacks of soda cans and around a central obstacle, trying to make the best time without knocking over any cans. However other robots manage to follow a straight path by going over the obstacle, and in a few cases picking up and moving the obstacle out of the way allowing the second robot to go much faster. The second project required traversing rough terrain as the robot must go over a simulated Moonscape trying to find the leaky habitat marked with a beacon and plug the hole, literally, However, it turns out that many of the groups were able to program in all of the paths, and then have the robot, early in its traverse, scan for a specific pattern of rocks to determine which configuration was in play. The third project, attempted to be substantially different that the previous two. Towards that end the students were given a choice of four possible projects, working in larger groups, to prototype a project much in the spirit of the Managing Creativity approach. The exact definition of each of these was largely left up to the team, and in this project significant augmentation of the kit was allowed. In addition to the projects, additional assignments are given throughout the term that tie programming to other computer tools needed by engineers.

For example, programs are written to store sensor values in an array. The arrays are then uploaded from the robot to the PC and placed into spreadsheet programs for analysis and graphing. This exercise teaches rudimentary data s tructures as well as spre adsheet techni ques. One of the important things we learned was that doing a project with a large group in a short time really shows whether or not you have adequately taught the team management and conflict resolution strategies to the students we had not. But despite some of the personnel difficulties, the majority of the projects resulted in creative, and for the most part successful robots, and enthusiastic students. 4 An AI Robotics Course At the University of North Florida, the Botball kit has been used for the past 2 years to support a course in AI robotics offered by the Department of Computer Science. Cross fertilization with ME occurs at the graduate level with exploration of mobile robots interacting with stationary robot manipulators. The Botball kit provides an ideal means for establishing and maintaining an effective support laboratory for an upper level major elective in AI robotics, providing handson experience with concepts covered by the course. The student audience is wellprepared in systems software, so the focus is on AI concepts and the means to achieve working models that utilize the concepts. Students from engineering as well as computer science have taken the course. As is perhaps appropriate for computer science departments, the approach employed does not require dedication of a room for an instructional lab. The Botball kit developed by KIPR provides a comprehensive solution for supporting AI robotics courses, providing all of the advantages of using a component assembly approach. For work done with prefabricated base units, it is a generally possible to produce acceptable counterparts using the Botball kit to illustrate the same concepts eg., a sonar ring for avoid behaviors.

The presence of these students was a direct outcome of serving as the host institution for a Botball regional beginning in 1997. These students and their friends were increasingly requesting an AI robotics course opportunity that reflected the kind of activities characterizing Botball; namely, a course emphasizing autonomous robots, employing AI techniques to achieve both performance and survivability objectives. Each lab involves deployment of a robot model that may be derived from a base design such as the one given in Figure 1 above, or one independently designed by the team. The progression of the labs requires deployment of an increasing amount of sensor technology to achieve lab objectives, reinforcing ideas introduced in lecture and laying a basis for exploring later topics, such as sensor fusion. On the day each lab is due, the teams compete for best performance, which has some bearing on grade there is an expected minimal performance level. Class follow up sessions examine solutions using different AI robotics paradigms. Shortly after mid term, the specification for the term project is released, which is cast in the form of a game taken from KIPR’s

Collegiate Botball Challenge. At the end of the term each team must demonstrate performance by playing the game with no opponent this establishes a relative ranking of teams, then participate in a doubleelimination tournament as a test of survivability. A team's entry may consist of more than one robot. All labs require submission of a lab report in a prescribed format, to include a verification of testing outcomes by one of the opposing teams. 5 Aerospace Engineering Robotics Lab In the Spring of 2004, the OU added a new robotics lab to its aerospace curriculum. The goal of this course is to familiarize aerospace students with the electronics and programming now common in various aspects of avionics and space robotics.

This senior level course may be the first course involving programming that many of the students have had since their freshman year. In this module all of the sensors are examined and their output over a range of inputs is plotted against one another in particular against the sonar which is already calibrated to metric units. Even the camera is calibrated to find out the size of objects at different distances, and then back calculate the focal length of the lens. The second module in the course concentrates on motors and servos. The students implement encoders and then use the gear motors under bangbang control and compare their positional accuracy to that of the servos provided in the kit. The third unit introduces more complex control systems ploops, and pdloops and compares their performance to the positional servo motors. The students create a mobile robot that then performs some positional and speed servoing using the encoders to close the loop. Again the results are analyzed and written up in a report. The fourth module combines the results of the first three to produce a mobile robot capable of controlled movement. The students create robots that can perform line following and analyze the change in speed verses maneuverability as the rate of turn and sampling rate are changed. Similar exercises are done with light tracking and following a colored object. The fifth module covers kinematics and manipulation. A simple 2DoF arm is built out of the kit materials and inverse kinematics are calculated. Experiments with positional control of the arm are performed and the results written up. The last portion of the class then tries to combine all of the pieces that have been created so far, into a single unified challenge. The task involves object tracking, dead reckoning, position estimation, manipulation and a large design element.

The annual challenge which now takes place as part of the National Conference on Educational Robotics colocated in 2004 with the National Conference on Artificial Intelligence is similar but distinctly different from the high school contest. The motivation for having a different challenge is twofold first, these are college students with potentially more time and access to more expertise than your typical high school student, there fore they should be able to handle a more difficult challenge; second, by having a different contest, it makes it easier to avoid spontaneous challenges from the middle and high school teams who also attend the event. In the past, those challenges had sometimes had embarrassing outcomes for the college teams involved. In the college version, the game is designed so that all scoring should be the result of intentional manipulation. The college game also relies more heavily on elements of the Botball kit that are often under utilized by the high school teams e.g., the color camera. At OU we are offering some travel grants to college students who demonstrate a robot team that can perform in the college challenge. The top teams from that then do a head to head double elimination tournament to find the winners of the travel grants. Our hope is that the skills used for designing and programming the robots will take on a new level of importance, and be less likely to fade away as soon as the semester ends. 7 Conclusions End of course student surveys for all of these courses have shown an overwhelming positive response to the robot kits and robot projects. In the course surveys, the students also have endorsed the competition format employed with lab projects In providing a comprehensive kit and in serving as a single source of supply, KIPR has provided a solesource, reasonably priced means for utilizing a Handy Board componentbased approach for the support lab for AI robotics.

The incorporation of LEGO RCX elements into the kit also permits an instructor to draw on resources already developed for use with the LEGO Mindstorm kit. Becaus e of the m otivation that the robots pro vide the students, we are ab le to tea ch computi ng techni ques far be yond that which wo uld normal ly be cov ered by an enginee ring comput ing course. These include issues such as multithreading, structures, and semaphores. Topics that are more typical of an intermediate computer science curriculum. Computer science students also get advantages from robotics classes. They get to learn aspects of control, mechanics and electronics not addressed in the normal CS curriculum. In many of the engine ering dis ciplines, stude nts may never hav e to program during thei r undergraduate career with the exception of their intro programming course. However, the inclusion of a Botball collegiate game at the National Conferenc e on Educa tional Rob otics, no w encoura ges the students to kee p their comp uter skills active as they prepare for the Summer tournament. We believe that the use of robots as a teaching tool early in the engineering curriculum will both improve computer skills for nonCS engineers, and will also increase the number of students interested in pursuing computer science. His research interests include two main areas robotics technology and robotics as a mechanism for technology education. His interests in robotics technology are in automated planning, robotics, and communications with automated systems, especially as applied to planetary exploration and assistive technologies. His research interests include AI robotics, cognition modeling and simulation, and medical systems simulation. He has served as coordinator for the Florida Region Botball Educational Robotics Program for Middle and High Schools since 1997. The course at UNF reported in this paper was supported by NSF grant DUE0126676 CCLI program.

In the collegiate context, the available time can be devoted to introducing and illustrating concepts without having to devote a lot of time to equipment issues. In contrast to Botball, Beyond Botball has the added advantage of not being tied to the current version of the Botball kit.. Beyond Botball A Software Oriented Robotics Challenge for Undergraduate Education. Conference Paper Fulltext available Jan 2007 David P Miller Charles N. Winton Jerry B. Weinberg Beyond Botball is a thoroughly thought out robotics challenge that varies from year to year. The challenge does not presume specific equipment or software pack ages there are many techniques that can be used to accomplish each of the challenge goals. The challenge is distributed freely and is meant to be used as an end of semester project in a robotics or programming class. An open Beyond Botball tournament is held every year in conjunction with the NCER conference. This paper de scribes the program in more detail and how it has been used in several classes. View Show abstract. Local competitions are a part of many robotics courses; often they are the culmination of a sequence of laboratory exercises for building and programming a robot. Such labs effectively link Articles Baltes, Sklar, and Anderson 2004; Miller and Winton 2004; Stein, Schein, and Miller 2002 sons set of products and publications. To provide a jumpingoff point for further investigation of the available platforms, topics, and contests, we have a web page that offers an online compendium of the information in this article.. Components, Curriculum, and Community Robots and Robotics in Undergraduate AI Education. Article Fulltext available Mar 2006 AI MAG Zachary Dodds Lloyd Greenwald Ayanna Howard Jerry B. Weinberg This editorial introduction presents an overview of the robotic resources available to AI educators and provides context for the articles in this special issue.

We set the stage by addressing the tradeoffs among a number of established and emerging hardware and software platforms, curricular topics, and robot contests used to motivate and teach undergraduate AI. View Show abstract Robots for Education Chapter Fulltext available Jan 2008 David P Miller Illah Nourbakhsh Roland Siegwart This chapter provides an overview of the key ingredients that make successful education robots possible. Two very popular outlets for public interaction with robots are theTo make interactive, educational robots successful, a new level of technology robustness and standardization is required, and significant progress has been made on this front in the past decade. Educational robot devices consist of both hardware preassembled or as kits or components and software both as source code and programming environments. Section 55.3

discusses physical robot platforms that have achieved notable success, while Sect. 55.4 describes both lowlevel controllers that interface those platforms to highlevel computation, as well as the toplevel programming environments themselves. Finally, an important class of tool in the study and execution of educational robotic systems is the ability to evaluate the efficacy of a robot system formally in an educational context. View Show abstract The CBC A LINUXbased lowcost mobile robot controller Conference Paper Jun 2010 David P Miller Matthew Oelke Matthew J Roman Charles N. Winton Over the last five years, a number of powerful robotics controllers have become available. Only a small percentage of these are suitable for general use in robotics. In particular, they trivially interface with a large variety of sensors and effectors, have a well constructed software IDE that works with a standard programming language, are self contained and are easy to use. The CBC2 is a new robot controller that meets these conditions.

The CBC2 is both a USB host allowing the use of standard cameras, mass storage and network interfaces and a USB device for software downloads. This paper describes the CBC2, its capabilities and the KISSC IDE and associated libraries which include functionality ranging from color tracking to PID motor control. Based on feedback from that experience, design improvements were made and the CBC2 is being used in the 2010 Botball program and is also being made available for other uses. This evaluation discusses how kits and projects based on Mindstorms supported students exploration of the issues behind the design of agents from three classes in Russell and Norvigs intelligent agent taxonomy. View Show abstract Using Autonomous Robotics to Teach Science and Engineering Article Jun 1999 COMMUN ACM Randall D. Beer Hillel J. Chiel Richard F. Drushel View A Robotbased Laboratory for Teaching Artificial Intelligence Article Fulltext available Jul 1999 Lisa Meeden Deepak Kumar of the robots action decisions. More importantly, the robot theme provides a strong incentive towards learning because students want to see their inventions succeed. The goal of this proposal is to equip two identical robotics laboratories for teaching AI, one at Swarthmore College and one at Bryn Mawr College. Each laboratory will contain a collection of robot building stations as well as one sophisticated offtheshelf robot to demonstrate more advanced topics to the students. The deliverable for this project will be a laboratory manual that is closely integrated with a semester long AI course syllabus. The manual will be developed collaboratively and tested separately at the participating institutions. The overall effectiveness of this project will be determined by student feedback and performance.