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RESEARCH PAPER

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AUTONOMOUS MOBILE ROBOTS DESIGNING

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Abstract: *This paper presents the overview of robotics and related technologies. Also describes the architecture of robots such as software and hardware requirements. In this paper we give the detail discussion about the autonomous robotics, design, control and applications. This paper presents design concepts and guidelines for implementing an autonomous robot.*

Keywords: *robotics, design techniques, autonomous robotics, Omni – directional robotics.*

INTRODUCTION

Mobile robots are use in disaster recovery, military and exploration application. In these application the operation in rough unstructured terrain. The most mobile robots are design for these applications are tracked or Ackermann steered wheeled vehicles, for controlling the robots in both smooth and rough terrain have been well studied. These robots use in many place like scenarios, navigation in cluttered, rocky or obstacle dense urban environments can be difficult and impossible. The traditional tracked and wheel robots must reorient to perform some maneuvers, such that lateral displacement. Omni-directional mobile robots potentially navigate faster and most robustly through cluttered urban environment and over rough terrain, Due to ability to track near arbitrary motion profiles. Omni-directional mobile robot is able, kinematic ally, to move in any planar direction regardless of current pose, previous researcher developed the wide variety of Omni-directional mobile robots, wheel type including roller, mecanum, and spherical wheels. An Omni-directional mobile robots driven by active split offset casters (ASOC) modules use in indoor environment, ASOC modules do not use small roller or frictional drives , and thus potentially suitable for use in dirty, outdoor environments. Robotics in urology, urology has increasingly technology driven specially. The advancement of robotic surgical system in the last 10 years, urologists is the world leader with the use of such technology. The earliest use of robots for transurethral resection of the prostate, for the robotic devices for manipulating laparoscopes. Future possibilities, including the prospects for nanotechnology in urology, are awaited. "A re-programmable, multifunctional manipulator designed to move material, part, tools or specialized device through various programmed motions for the performance of a variety of task". [4, 6, 8]

ROBOT ARCHITECTURE:- The university of Plymouth bipedal , Robotics Bioloid comprehensive kit, he designed humanoid soccer player MK 1 (Mark 1) .the choice of a bioloid kit over the competing commercial humonid kit such as KHR-2 .The bioloid prefer over the other robot kit because it has greater servo torque (16.5 kg cm), programmable servos and price. Bioloid kit is used to form the other types of biedal robots. This provides the university for teaching purposes. [5,7]

Humanoid Team Humboldt and Nimbro team also used biolod robots combined with handheld computers. CM-5 circuit board is used for the controlling of bioloid .Which is designed by Robots, with an ATMEL Mega 128 micro controller. For the vision processing a more powerful CPU was required .a light carbon fiber shell protects the PDA. RS-232 serial port is interconnected by the PDA and the TMEL microcontroller. For the vision processing a specter SD camera (1.3mp inel) is connected to the SD-card slot of the PDA. [1, 2]

API for windows mobile 2003 and windows mobile 5.0 is provided by the spectectaiwan windows mobile 5.0 applications can be programmed by using the windows mobile 5.0. Pocket PC SDK for visual studio 2005. Each Biolod AX-12 servo has use its own ATMEL MEGA 8 microcontroller. The feet of the robots are made by the wood .The rounded foot prevents the robot from catching the carpet. According to the FIRA rule the maximum cross section of 14 cm. In the Robocup the size of the foot is depends upon the height H. The foot area A must not be exceed by the H^2/24. The larger cross section in the foot provides more stability. For the large

feet the mobility of the robot is limited. Robots give the motion editor software which allows the editing in the motion stored in the ATMEL MEGA128 flash memory. The flash memory organized in pages, each page store up to7 repots b0ody postures. The strength approach. This approach includes ease of editing the robots bipedal locomotion .the robot motions such as kicking the ball walking forward, walking side wards and walking back wards for to save over goals and stand up. *Motion Control Software,* Robots ATMEL on board software is not publically available. Robotics does however provide an example C program for simple servo control. Organization of flash memory. 0xE000is the base address of the motion data. Each page in the motion editor is 512 Bytes (0x200) it contains up to 7 poses. The size of the each poses is 64 Bytes .The first 64 Bytes of page reserved for the page setting. Another rest page for consist of 7x64 bytes blocks of poses.

ROBOT DESIGN

Hardware Design: - Beobot is the product of the emerging power of open source software. Servomotors are now widely used in remote control (RC) hobby vehicles. Servos must be cheap, durable and have ample torque for their size. The motor used to run RC car the constriction of larger lower cost RC vehicles. The beobost is based upon the vehicle.

A 4-wheel drive model that reaches speeds over 35MPH and is servo controlled. The drive motor, sleering is also controlled. Computer control is easy to interface. This is low cost mini SSCII servo controller, the size of of a silver dollar the interface between computer serial RS-232 interface and servo mechanisms of the type used in RC cars. The minimum three hardware components are required. i) E-maxx RC car, ii) Mini –SSCII, iii) A computer. Gasoline powered RC cars are also servo controlled. Mini-SSC has a resolution of 256 pixels, where high accuracy from servos is needed. [3]

The choice of the computer is also important for the robot design. An ideal computer is required to form the robot is called PICMG. We chose theRocky-3742EVFG, which is a dual 1GHZ PentiumIII based motherboard. Two motherboards are connected in the Beowulf style distributed computer. Integrated USB and serial ports connect to peripherals such as GPS, WIFI, Ethernel, Mini-SSC and LCDreadout panel. Flash is connected by a slot which is build by motherboard. This port is used for install mission critical software and boot components, a flash disk that is more resilient to shock than a standard hard drive.

Lithium Ion and Nickel metal Hydride batteries are used for the power. There is separation between the power source for the car and computer power source. The computer uses 7.2 volts eight power cells. They send the power a few custom designed components of the beobot , this is the computer power supply. The power of the robot computer is one to two hours depending on the type of the power cell. Robot drive power runs about 20 minutes. Battery calls are small and easy to replace.

Software design: - The greatest amount of flexibility Beobotis built on the Linux operating system. All the code and compiled the open source GNU C++ compiler and Libraries.

OMNI DIRECTIONAL ROBOTICS, [4, 5, 6], Mecanum wheel design pioneered in 1973 by macunam AB's BengtIilon. Principle of Mecanum wheel is central wheel with a number of roller placed at an angle around the periphery of the wheel. Force in the rotational directional of the wheel to force normal to the wheel directional. Depending on each individuals wheel speed and direction, and resulting combination of all the force produces a total force vector in any desired directions thus allowing the platform to move freely in direction of resulting force vectors without the changing the direction of the wheel .mecanum wheel design by Ilon with the 45degree slope in peripheral roller, slope in the outside direction. In a system using the four of mecanum wheels provides Omni –directional movement for a vehicle without need of the conventional steering system. In the macunam wheel slipping is the common problem; it has only one roller with a single point of ground contact at any one time. Dynamics of the mecanum while create force vector in the both in the X and Y directional. While only being in the Y direction. Four wheels mecanum, one at each corner of the chassis, net force in the X and Y direction. It is difficult with this strategy there are four variable to control three degree of freedom. It is difficult to control. [5]

AUTONOMOUS MOBILE ROBOTS DESIGN

An autonomous robot is a machine. Robot operates on unpredictable and partially unknown environment. Robots used in manufacturing plants, where the environment is highly controlled .Autonomous robots cannot be executed by the pre programmed action because in advance what will be the universe to require. The emergent overall behavior is flexible robust to against environment noise and mechanical failure, and based on compact modular codes. The autonomous mobile robotics done at our laboratory, covering hardware methods and design, adaptive control, collective autonomous robotics, and conclude with considerations on industrial applications. [3, 9, 10]

Issues in Hardware: - Far a valid long time investigation methodology to developed autonomous mobile robots, both for industrial application and research application. Real mobile are not always employed during the initial research stage, because they are some practical reason behind this fact. Mostly researchers working in the field of artificial intelligence are software engineers or academics coming from various departments like biology, psychology or anatomy. Mobile robots are very unstable device.

Hardware and Software Modality: - Hardware modality enables different possible configurations and experiments using of the same basics components. It means also possible intension, globally and intension and flexibility.

Evolutionary Robotics:-Evolutionary robotics is a technique for automatic creation of control system for autonomous robots that is inspired upon Draconian principle of satellite reproduction of the fittest individual's .evolutionary approach requires more human knowledge.

A population of different artificial chromosomes, each chromosomes encoding the instructions to build a different nuero controller, that neuro controller is decoded and tested on the robots . While each robots interacts through environment according to the decoded control system " fitness function" automatically its performance for the use of the new population of increasing better individuals created by repetitively applying relative reproduction.

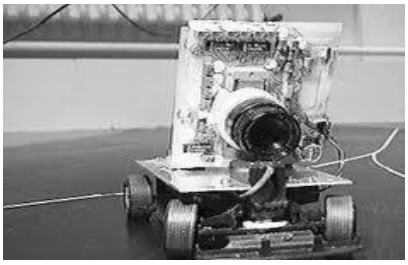

FIGURE 1: Autonomous Robot Architecture

Issues in collective Autonomous Robotics: - Collective autonomous robotics deals with teams of many autonomous robots, which are involved in a shared mission. Design and control of the robots groups requires to analysis the communication interference and co operation, Bio inspired collective favors decent raised solutions and focus of robot-robot and robot environment interactions. The cooperative team – behaviors can be achieved both by explicit programming and by adaptation. If the control solution is decentralized explicitly programming of each single robot is easy evolutionary or learning techniques, such as genetic algorithms or reinforcement learning methods can help to the engineer to determine the behaviors of the individual robots in a team. Only team performance is determined, robots are faced with a credit assignment problem. Every robot is aware the effect of the environment on it. We can achieve real team solutions only at the price of dealing with credit assignment problem.

Applications of Autonomous Robotics: - Low complexity of current application. The control program is extensively tested on the robot in order to adjust poor reaction, neural network, genetic algorithms and neuro-fuzzy approach. Robot must be sold in numerous copies to customers who will read a short set of recommendations. Application is energy autonomy which is currently supported by solar cells. Power Requirement is negligible for sensor reading. Current limitations in energy autonomy naturally favor "White-Collar" applications of autonomous robots such as surveillance. [11]

CONCLUSION

In this paper we discuss the overview of some important issues in mobile autonomous robotics, more focus on the hardware and software designing issues. At the hardware level we required various designing tools and complex techniques. At the software level we discuss the various implementation approaches. In this paper we briefly discuss about the Omni – directional robotics and their hardware and software designing.

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