

A Survey on Android Controlled Robots

Danish K.V^{#1}, Dhilber M^{#2}, Shana Parveen^{#3}, Shemitha P.A^{*4}

[#]Bachelor of Technology students ^{*}Assistant Professor

Department of Computer Science, IES College of Engineering

University of Calicut, Kerala, India

Abstract — Robotics is a fast growing field which has vast emerging opportunities today. This paper conducts a survey on different android controlled robots and discusses the flexibility and affordability of robotic concepts. Due to increasing computing capabilities and the reconfigurable and extendible properties have made robotic platforms popular. Here the robots are controlled over cell phones. Hence they are called Cellbots. There are different methodologies used in construction of Cellbots. They vary according to the components and techniques used to implement.

Keywords — Cell bots, Robotics, Android, Security.

I. INTRODUCTION

Robotics is a fascinating discipline that easily engages engineering students. This field continuously expands at a remarkable rate. Every year more advanced robots are created. The high complexity of the hardware and software and the typical high cost makes robotics out of reach of many students and researchers. The field of research and education make use of large number of robotic platforms. These robotic platforms include Lego Mindstorms NXT and more recent EV3, iRobot Create, VEX, TETRIX, SRV-1 and Bioloid. They are enough to be simple and inexpensive. Usually, However, they don't have powerful onboard computers and large sensor suites. And also these platforms have difficulties working outdoors on uneven terrain. In Research community, robots such as the Khepera, Koala and Pioneer are very popular. But due to the need of additional equipments like camera, sensors and onboard computers, the total cost is high being they are more capable than the above platforms. Recent years, the most affordable robots are considered as Humanoid Robots such as the NAO and the DARwIn –OP.

As an alternative to the expensive existing platforms, the concept of Smartphone based robotics is introduced. It is believed that the sensing power and computing capabilities smart phones and availability of interfacing boards made this concept of robotic platform inexpensive and affordable. Popularity in Smartphone based robotics excites applications in industry and academics. The technology of controlling robots wirelessly has been utilized in the search and rescue missions recent years. It is believed that the mobile telecommunications and the internet that has highly penetrated in the daily living of people around the world can help in the rescue operation. Even in undeveloped countries, the mobile telephony

technology is even highly penetrated. More than 4.55 billion people use a mobile phone worldwide and more than third of this population uses Smartphone. As the result application markets become wider for the Smartphone.

Day-to-day, at a remarkable rate, the computational power of handheld devices, such as mobile phones and tablets increases. They are currently equipped with powerful video cameras , graphical processing units and quad-core processors , long lasting batteries , location providers (GPS, Wi-Fi, Cell-ID), and a multitude of sensors such as acceleration and orientation sensors in spite of having compact form factor. Smartphone having impressive suite of communication options (Bluetooth, Wi-Fi, Wi-Fi Direct, 3G, 4G) are powered by long lasting batters. Smartphone OS's provide a Software Development Kit (SDK) enabling to create applications. It is believed that the promising candidates for onboard sensing and computing in autonomous robots are for sure the Smartphones due to these specifications.

In this paper, we survey the scope and methodologies used for different purpose robots. By comparing the efficiencies, affordability, reliability, flexibility and cost specifications, a different robotic concept is introduced that is supposed to overcome all the drawbacks of existing robots and thus creates inexpensive robotic platform that assists researchers and educators.

II. RELATED WORKS

Similar concepts have been implemented in various other works. In [1] the RC car unit is controlled by the Smartphone running on android platform. Hardware is developed over Arduino mega and Arduino UNO controller boards. Arduino mega controls the propulsion and direction, while UNO processes the sensor information. HC-SR04 ultrasonic ranging detector is used as distance sensor.

The power consumption of the system at full load is relatively high shown by the current measurements of the AndroRC. The system is meant to be used in the occurrence of natural disasters for search missions. The RC unit being small can pass through small tight spaces and it is light weight so that it doesn't add extra weight.

In [2] the emerging android technology controls the surveillance robot. It is designed in such a way that android application controls the robotic

vehicle. The signals transmitted by application are sensed by control unit using Bluetooth device that is interfaced to it and the data moves the robot. The transmitter and receiver sections are implemented separately. In transmitter, Atmel 89c2051 is used, which is a 20pin version of 8051 microcontroller. We have RF encoder capable to cover 100m distance and operate at a frequency of 433MHz. In the Receiver section Atmel 89c51 microcontroller is used. HC-06 Bluetooth Receiver module is used in slave configuration which is interfaced with 8051 microcontroller. A wireless camera is mounted over the RC car unit to capture videos up to 50m which operates on a frequency of 50 MHz-30 GHz. Motors are driven by L293D controller.

Most robots are built in accordance to their applications. [3] is a security application robot that uses Atmel 89c52 as the microcontroller. A dedicated application controls the embedded robotic hardware. The bot movements are controlled according to the signals received from Smartphone via Bluetooth. Bluetooth module feed the input to the MCU which then transferred to L293D H-Bridge motor driver and make robot move. A wireless camera with infrared lighting is mounted for security purpose.

Another implementation of a related work uses Atmega 328 as microcontroller. [4] uses HC-06 Bluetooth module to receive signals from Smartphone. DC motors are controlled by H-bridge L293D driver. HC-SR04 transceiver module is used for detecting objects. The 9v battery gives power to MCU as well as the motors. The entire setup is manually controlled using an android application and one of the purpose of the robot is spying during the time of wars

III. PROPOSED SYSTEM

The proposed system builds a RC unit using IOIO board as an interface. It overcomes all the limits of the surveyed systems. Instead of Bluetooth more advanced and reliable Wi-Fi is used. The Smartphone is interfaced with the board via USB. Another module (PC) will send signals to the Smartphone through Wi-Fi and hence controls the RC unit. Application in the phone will feed the PWM signals received to the interfacing board and board drives the motor. IR sensors and servos are connected to the IOIO board. All the capabilities of Smartphone is utilized here. User is capable of streaming video from the Smartphone.

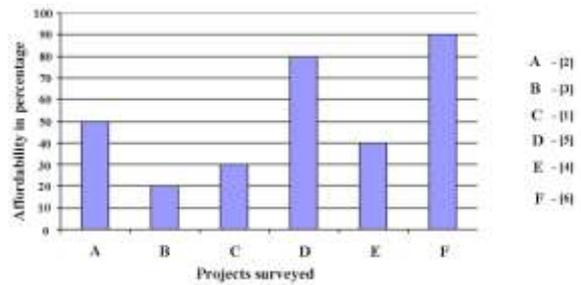


Fig 1 A bar chart showing affordability of various techniques implemented in different works

Figure 1 shows the level of affordability in techniques used in respective to the different works. The preliminary survey shows that as technology passed hand to hand, the advancements in the field have encouraged the public appreciably. According to the data obtained, the half of 100% was interested in the technology developed in [2]. This may be due to high cost. As in [3], due to low secure in communication and less processing power caused the affordability percentage down to 20%. The drawbacks found in [3] was overcome in [1] and thus the value increased by 10% but because technology supposed to be inefficient and thus the value doesn't cross the half of 100%. The availability of robotic hardware components and easiness in creation of robotic platform thus increased the affordability level of [5]. But the high cost of robotic platform components caused in [5] was overcome in [6], the proposed system, and thus has high level of affordability among the other works that was chosen for survey.

IV. CONCLUSIONS

Although field of robotics is fast growing there are more possibility of success in coming era. The growing computer capacity and advent of new high-speed technology opens realistic opportunity for new methods of robotic control theory. The need for high performance robots together with the technical improvement created accurate and intelligent robots. This creation was made possible using new control devices, drivers and advance algorithm for control operation.

Here implementation and techniques of four different android controlled robots were discussed and subjected for surveying. The main purpose of developing this category of robot is to make it cheap and reachable to students and researchers and assist in researches. More advanced studies and inventions are yet to come in this field.

REFERENCES

- [1] AndroRC: An Android Remote Control Car Unit for Search Missions. Yuxin Jing, Letian Zhang, Irwin Arce, Aydin Farajidavar Integrated Medical Systems Laboratory, Dept. of Electrical and Computer Engineering, New York Institute of Technology.
- [2] SMARTPHONE BASED ROBOTIC CONTROL FOR SURVEILLANCE APPLICATIONS. M.Selvam, M.E Embedded Systems, Dept. of ECE, Karpagam University, Coimbatore, Tamilnadu, India.
- [3] Unmanned Ground Vehicle Remote Controlled Robot for Security Applications. A.Abinaya, Mr. A.Jayakumar M.E UG student, Associative professor, Dept. of Electronics and Communication Engineering, IFET College of Engineering, Villupuram, Tamilnadu.
- [4] Smart Phone Controlled Robot Using ATMEGA328 Microcontroller. Aniket R. Yeole, Sapa M, Bramhankar, Monali D. wani, Mukesh P. Mahajan UG student, Dept. of E&Tc, Sandip Institute of Technology and research centre, Nashik, Maharashtra, India.
- [5] Android Mobile Phone Controlled Bluetooth Robot Using 8051 Microcontroller. Ritika Pahuja, Narender Kumar Electronics & Communication Engineering, Department, BRCM College of Engineering & Technology, Bahal, India
- [6] Suma –The CellBot, Smartphone Utilized Machine on Android
- [7] An Autonomous Robot Navigation K.D.V.S.Anil kumar, M.suman Dept. of ECM. K.L.University, Vaddeswaram, A.P, India.