REPORT PROJECT
D-SPY ROBOT

BY

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SUBMISSION OF THIS REPORT IS TO FULFILL
THE REQUIREMENT FOR CERTIFICATE OF
ELECTRONIC ENGINEERING (COMPUTER) AT THE
DEPARTMENT OF ELECTRICAL ENGINEERING
SEBERANG PERAI POLYTECHNIC
JUNE 2017

DECLARATION

Here, I declare that this report is based on my work Praveen A/L Arunasalam, Privinraj A/L Puspa Rajan and Muhammad Faris Azimi Bin Abdul Ghani with the help of information from informed sources in the confession. I also declare the result of my project was never produced by any students as well as from other institutions.

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.....

(Muhammad Faris Azimi Bin Abdul Ghani)

DATE : 3/10/2017

Recommend by Supervisor Project:

.....

(Madam Masliza Binti Maskin)

MASLIZA BT MASKIN
PENSYARAH JABATAN KEJUTERAAN ELEKTRIK
POLITEKNIK SEBERANG PERAI

DATE : 3/11/2017

*(Lecturer Stamp)

APPRECIATION

Selamat Sejahtera.....thanks are due to the divine bounties, let me Praveen A/L Arunasalam, Privinraj A/L Puspa Rajan and Muhammad Faris Azimi Bin Abdul Ghani studying in Seberang Perai Polytechnic course of Diploma in Electronic Engineering (Computer), has successfully completed the responsibilities entrusted to us to complete a final project to the time set by the as a condition to get the Diploma Polytechnic. Here would like to take this opportunity to express our appreciation given to my Supervisor that Madam Masliza Binti Maskin a lecturer in Electrical Engineering who help me throughout the period and give theoretical knowledge and skill which are not tired of helping us in our final project the D - SPY ROBOT.

Apart from that, we want thank you also to the suppliers and distributors of electronic goods for selling and supplying electronic components to us for generating the final project. Besides that, we also want thanks to our friends, beloved family and anyone who participated in the success of this final project directly and indirectly.

THANK YOU.

Acknowledgement

Great thanks to God for letting me us through our project on build and designing a spy robot. First and foremost, we would like to express our appreciation and deep respect to our supervisor, Mdm. Masliza Binti Maskin for the guidance and encouraged give through on the progressing this project. With his full support, this project building and designing as expected from the objectives.

Special thanks to our friends that share their idea and advice in designing our project. Their support and encouragement in our project have helped me in various aspects. Without their help, this project would very difficult to gone through and it will consume more time to finish.

Finally, thank to our dear family that support in various field such as fund, idea and moral in the project progression. I hope that this project able to be a step for an advance D-spy robot in the future because nowadays a lot of the spy robot designed for difference purpose.

ABSTRACT

Spy camera widely use entire world to survey the situation or environment at certain range. Basically the spy camera used by bank, jewellery shop and others organization to secure their organization facilities. By using this device their facilities security can be easily monitored from far without need to survey by human from the room that called control room.

Nowadays, functions of spy camera have been widely used by military to survey the enemy location before the military forces take their action. By using it they can safe man power because it will be the first line military force and it can be controlled from far away.

This project will introduce the surveillance robot that able to survey the situation via computer and the spy camera is manual that mean there is need external aid from human to move it. We using remote controller to make it easy to move wherever we want and aims to. This robot will used obstacle avoider sensor. The obstacle avoidance use to avoid obstacle face it. For the conclusion, this project is to build an autonomous spy robot that able to avoid obstacle by using IR sensor. Others the robot has wireless visual system that the human able to monitor the robot movement via computer by using wireless camera module.

ABSTRAK

Kamera pengintip telah digunakan secara meluas di seluruh dunia untuk digunakan sebagai pemerhati situasi atau persekitaran pada jarak yang tertentu. Secara umumnya, kamera pengintip digunakan oleh bank-bank, kedai barangan kemas serta organisasi-organisasi untuk menjaga keselamatan kemudahan atau barangan dalam organisasi mereka. Dengan penggunaan alat ini, keselamatan kemudahan atau barangan dalam organisasi mereka mudah untuk di kawal dari jarak jauh tanpa memerlukan manusia untuk meronda dari sebuah bilik yang dikenali sebagai bilik kawalan.

Pada masa kini, fungsi kamera pengintip telah meluas digunakan oleh pihak tentera untuk mengintip lokasi pihak musuh sebelum tentera mengambil tindakan. Dengan menggunakan kemudahan ini, mereka dapat menyelamatkan nyawa tentera kerana alat ini akan menjadi barisan hadapan peperangan kerana ia boleh dikawal dari jarak yang jauh. Projek ini akan memperkenalkan sebuah robot pemantau yang berkebolehan untuk melihat keadaan persekitaran melalui computer dan kamera pengintip ini adalah tidak bergerak sendiri yang bermaksud ia memerlukan bantuan luaran dari manusia untuk menggerakkannya. Kami menggunakan alat kawalan jauh untuk mengawal robot ini.

Robot ini akan menggunakan sensor pengelak halangan untuk membolehkannya bergerak sendiri. Pengelak halangan digunakan untuk mengelak halangan yang ditemui. Secara keseluruhannya, projek ini bertujuan untuk membina sebuah robot pengintip yang berkebolehan untuk mengelak halangan dengan menggunkan sensor infrared. Selain itu, robot ini menpunyai system paparan tanpa wayar yang membolehkan manusia menonton pergerakkan robot melalui computer dengan menggunakan modul kamera tanpa wayar.

List of Figures:

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List of Short Forms:

1. **DC= Direct Current**
2. **100/200m = meter**
3. **D-SPY = Digital**
4. **TV= Television**
5. **IC = Integrated Circuit**
6. **KL = Kuala Lumpur**
7. **Arduino IDE = Integrated Development Environment**
8. **PCB = Printed Circuit Board**
9. **5V/12V = Voltage**
10. **9VDC = Voltage Direct Current**
11. **2000MHz = Mega Hertz (Frequency)**
12. **I/O = Input/output**
13. **UART = universal asynchronous receiver-transmitter**

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CHAPTER 1

PROJECT INTRODUCTION

1.1 Introduction

The history of robots has its origins on the ancient world. The modern concept began to be developed with the onset of the Industrial Revolution which allowed for the use of complex mechanics and the subsequent introduction of electricity. Besides that, this made it possible to power machines with small compact motors. In the early 20th century, the notion of a humanoid machine was developed. Today, it is now possible to envisage human sized robots with the capacity for near human thoughts and movement.

Nowadays robot has been widely used in various fields like industries, academic, research and development, militaries and others. This chapter defines the robot, the project on autonomous spy robot. There are objective and scope of project those give the direction to this project. The project is to build a robot that has capability to avoid any obstacle detected. Others the robot will attach wireless visual system that human able to monitor the robot vision using computer, smart phone and TV.

Nowadays robot has been widely used in various fields like industries, academic, research and development, militaries and others. This chapter defines the robot, the project on autonomous spy robot. There are objective and scope of project those give the direction to this project. The project is to build a robot that has capability to avoid any obstacle detected. Others the robot will attach wireless visual system that human able to monitor the robot vision using computer, smart phone and TV.

This project named, D-Spy robot is to design a machine which can be controlled by the Bluetooth. The maximum controllable range is 30 meters. The application has four buttons to control the robot in four directions. Furthermore, the robot senses the surroundings through the CCD camera and sends to the receiver through the Bluetooth devices. D-Spy robot is made so small and compact enough to easily transport. Here Arduino Uno is used with 4K bytes of in-system programmable Flash memory. Finally, the Bluetooth device is used to control the motors of the D-Spy robot control system.

1.1.1 The D-Spy Robot

The D-spy robot is the robot that consist wireless camera that human able to monitor via computer, smart phone and TV as a spy. Today, there are many kinds of spy robot being offered in the market. They are from the range of RM350- RM7000 and the price depends on how advance the system is. Today wireless system have been widely used by many company because wireless can save cost of wiring, easy to install, occupy lesser space, easy for maintenance and more reliable.

Moreover, there are three types of wireless communications, Infrared, Bluetooth and Radio Frequency. Bluetooth device normally is chosen for the wireless spy robot because it has large connectivity range and it is more reliable that other wireless communication system. We using Bluetooth device to make it easy to move wherever we want and aims to.

In the market now, wireless spy robot basically works in two ways. One is use as security purpose like a guard that the robot will control by human at the control room to observe the security of the organization building. Usually the robot will placed at the fixed location and the unit of the robot will be high needed to observe at the large building.

1.2 Problem Statement

There are many spy or surveillances camera widely used for home or organization security system. Some of the design able to control via computer, smart phone and TV that has the wide range of transmit and receive data. With this device the human will able to control and see the wireless visual system via computer, smart phone and TV from other location. In the event of explosion, earthquake or industrial damages that made the building collapse or fire broke in the building, people faces several constraints in variety of aspect such as the difficulties in entering the building, and make through several obstacles with small size of hole. In this situation it hard for us as human to come in to the building that consist of explosive material it can risk our life. When people cannot enter the building, they also cannot see what happened inside the building and know the source or type of explosion material used or trapped people inside.

Monitoring camera device display can help them to visualize the actual situation. Others else, nowadays it seems in recent years being busy has become the rule rather than the exception. Busy lifestyle parents in taking care of baby or other things to watch every moment it is hard to do. Lifestyle working from both mom and dad has become trend in metropolis city. Monitoring camera device display can help the busy parent or others in monitor the situation in a baby room, living hall or private room in a short

distance control used only on the laptop. Conventionally, D-Spy robots controlled by Bluetooth device, which have the drawbacks of limited working range, limited frequency range and the limited control. Use of a mobile phone for robotic control can overcome these limitations. It provides the advantage of robust control, working range as large as the coverage area of the service provider.

Besides that, the circuitry of D-Spy robot consists of controller interface for control operations the components used in this prototype model are flexible and cost effective. Other problems that we face are the D-Spy robot is a machine which must control carefully to avoid any systematic error when connecting to our PC or Laptop or Television. The maximum controllable range is 30meters. We also must sharp and focus when handle the four switches to control the robot in four directions.

The D-Spy robot senses the surroundings through the CCD camera and sends to the receiver through the video device. D-Spy robots are made so small and compact enough to easily transport. Some of the spy robots always need the human to control the robot movement and the human need to focus totally on the robot when it is moves. Other than that the robot is not capable to hide when the enemy detected because the robot controlled by human and the human is not able to know when there are enemy or human nearby. Therefore this project will be focus on build the wireless visual system robot to that has capability to move and capable to hide or stop its movement when there are human or enemy seen on the camera using laptop, smart phone and TV.

1.3 Objective

There are three objectives in this project. The main objective of this project is to build a robot that moves manually with need of external aids. It is the most basic application of D-Spy robot is:

a) To design and construct a mini robot which would help to monitor all things through a camera.

b) To develop the movements of the robot via wirelessly control using application in computer, smart phone and TV

c) To make a robot which is fully portable, small size, lightweight and manual featured with user friendly interface.

In conclude, the objective is to build a robot with wireless vision system. The wireless visual system is used to human monitor the robot vision via computer, smart phone and TV. To build the wireless visual system, the wireless camera will be applied on the robot and the wireless camera will transmit the visual around the robot to the receiver on the computer.

1.4 The Scope

The following are the guidelines that listed to ensure the project is conducted within its boundary of mechanical hardware modification, electronics and programming. This is to ensure the project is heading in the right direction to achieve its intended objectives. The scope of this project is to design a mini spy robot that is to build wireless visual system by applying wireless camera on the robot so that the human can observe the robot via computer, smart phone and TV. The mechanical design of robot is small and light as robot cannot easily see by human. It is divided into two parts which is hardware and software.

Hardware part consists of motor, Arduino, communication, and visual. Software consists of Embedded Programming and Windows Programming. Embedded Programming is for Arduino that needs to be program for control all the connection input and output circuit. The communication is Bluetooth Technology that controls the signal of movement between robot and application. The motor that we used are dc motor to control the movement of the robot.

Besides that, the need to travel on flat surface as the tyres are small it cannot travel on uneven surfaces.

Furthermore, the Bluetooth device control has the adequate range up to 30metres with proper antenna besides being in directional. On the other hand, a video transmitter would function over a limited range of about 200m and the antenna transmitter has to be oriented towards the receiver module quite precisely. Next, we also are able to steer it towards left and right directions.

Finally, the entire project is split up into sections and each section is explain in the sufficient detail to enable you not only to fabricate the present design but also exploit this principles for evolving our own design with added functions.

1.5 Project Outline

This thesis consists of five chapters. Chapter one explains the introductory of the project including the objective and scope of this project. Also mention the problem statement and general project proposed.

Chapter two describes literature review more about previous study on topics that related to the project. It will cover both, universities research and

implementations by other companies or organizations that suitable to relate on autonomous spy robot.

Chapter three will cover the methodology of the project. The main to topic of this chapter will describe the three most important subjects and there are hardware designing, electronic and circuit designing and programming using suitable Arduino software.

Chapter four is about result and analysis. It describes about background research, components cost, programming and troubleshooting.

Chapter five is about suggestions, discussions and conclusion about our projects.

1.6 Significant

The idea of D-Spy robot comes with the thought of creating something to survey dangerous situations without enemy's concern effectively. We are creating a product that will change the mind-set of every individual who is seeking this type of device for positive purposes. It also inspires people to use more advance devices in the future to make task easier than nowadays.

1.7 Outcome of the Project

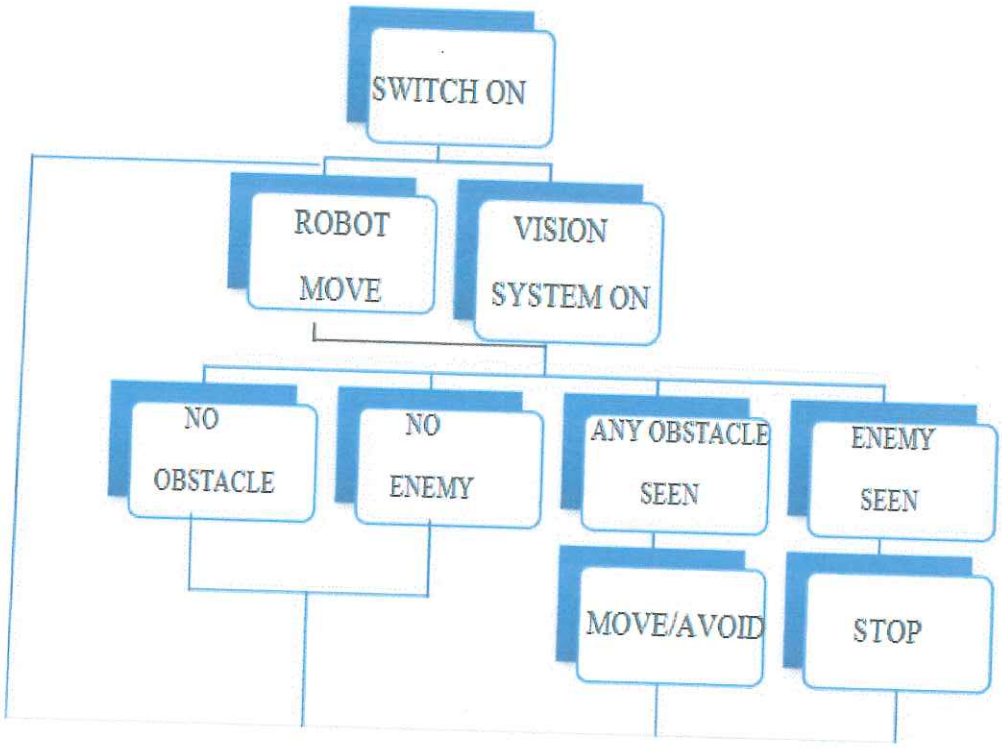

Figure 1.7 Outcome of the Project

1.8 Summary

D-Spy robot is the robot that has ability to spy and to survey the environment or situation at certain place using wireless camera. The visual gathering from the spy robot can be recorded and viewed by human directly. Moreover this project will build a robot with wireless visual system that the user can observe the situation via computer, smart phone and TV.

CHAPTER 2

Literature Review

2.1 Introduction

Conducting the literature review was done prior to undertaking the project. This will critically provide as much information as needed on the technology available and methodologies used by other research counterparts around the world on the topic. This chapter provides the summary of literature reviews on topics related to spy robot or robot that has capability to survey the environment via wireless vision system including autonomous robot with obstacle avoider. The modern concept began to be developed with the onset of the Industrial Revolution which allowed for the use of complex mechanics and the subsequent introduction of electricity. Besides that, this made it possible to power machines with small compact motors. In the early 20th century, the notion of a humanoid machine was developed. Today, it is now possible to envisage human sized robots with the capacity for near

human thoughts and movement. Nowadays robot has been widely used in various fields like industries, academic, research and development, militaries and others. This chapter defines the robot, the project on autonomous spy robot. There are objective and scope of project those give the direction to this project. The project is to build a robot that has capability to avoid any obstacle detected. Others the robot will attach wireless visual system that human able to monitor the robot vision using computer, smart phone and TV.

2.1.1 D-Spy Robot

D-Spy robot is a robot which can perform desired tasks in unstructured environments with human guidance needed. Maybe not every degree of freedom exists in their surrounding environment but the work place of the factory robot is challenging and can often be unpredictable or even chaotic. The exact orientation and position of the next object of work and even the type of object and the required task must be determined. This can vary unpredictably at least from the robot's point of view.

The D-Spy robot has the ability as follow:

1) Gain information about the environment.
2) Work for an extended period without human intervention.
3) Move either all or part of itself throughout its operating environment.
4) Avoid situations that are harmful to people, property, or itself.

2.2 Safety Steps

1) Make sure equipment which in use in safe situation to make this project.

2) Be careful during etching process because ferric chloride acid solvent is corrosive.

3) Don't play when using drilling process because it can injured human and may damage the circuit.

4) Hot soldering iron must be put in at a safe after being used.

5) Don't solder the IC without it housing because it may damage your IC in the board.

6) During works, avoiding joking around because it is very dangerous.

2.3 Problem Encountered

When developing this system, we have encountered several problems. During to finish this project, we faced a few problem according to the following:

2.3.1 The Problem

A) Difficult to find the component

B) Difficult how to use the electronic component

C) Programming error

D) Bad circuit line (malfunction or line breaks)

2.3.2 To Solve the Problem

A) We have to order the components in other place outside Penang such as Ipoh, Johor and KL.

B) Referring and doing some research from electronic books.

C) Surfed guidelines from the internet

D) Refer to our project supervisor or an experience lecturer/ personal

E) Debugged the circuit by the implemented a jumper wire to solve the torn lines.

2.4 Material/Components for D-Spy Robot

2.4.1 Arduino Uno

Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments.

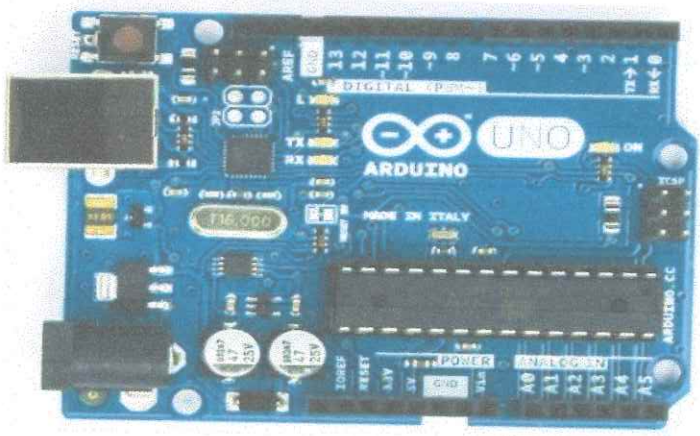

Figure 2.4.1Arduino Uno Board

2.4.2 Arduino IDE Software

For programming, writing code, verifying and uploading to Arduino Uno board.

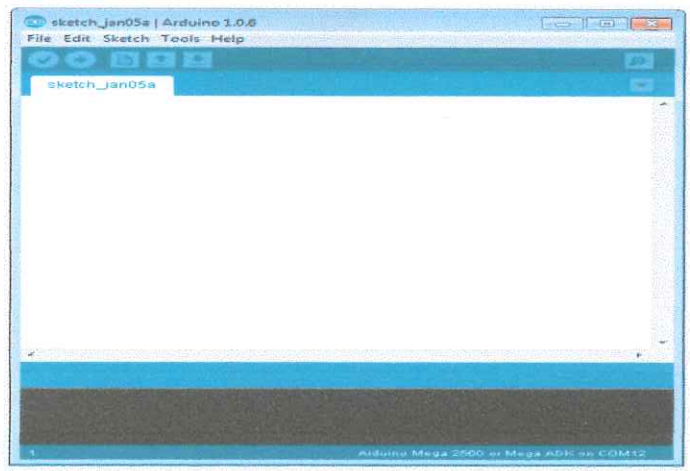

Figure 2.4.2:Arduino softwareprogramming window

2.4.3 Motor Driver – L293D

The motor driver was used to isolate the motor from the main controller as the high current consumption of the motor may damage the main controller directly. The motor driver was capable to drive two DC

motors. In addition, the speed of each motor can be controlled through the enable pin of each side. The motor driver received the control signal from the main controller and to control the motor speed and direction accordingly.

Figure 2.4.3 DC Motor

2.4.4 Wireless System Robot

Wireless system robot is the robots that have wireless connection to operate wireless. There are much type of wireless system such as wireless visual system, wireless sound system, wireless control system and others. Normally wireless system robot is the wireless control robot where the human able to control robot wireless and for the advance wireless control robot, the robot will have wireless visual system that the human able to control the robot for the large range via wireless visual system.

2.4.5 Bluetooth HC-06

The **HC-06** module only can be a slave. This makes it only useful for say connecting a notebook as a master to a robot with a slave module e.g. for a wireless serial bridge. Besides that, using HC06 Bluetooth to Serial Wireless UART Adaptors with Arduino. Sending data between an Arduino or compatible board and a Bluetooth-equipped device such as an Android smartphone or tablet is very easy thanks to the inexpensive HC-06 Bluetooth modules you may have seen on the market.

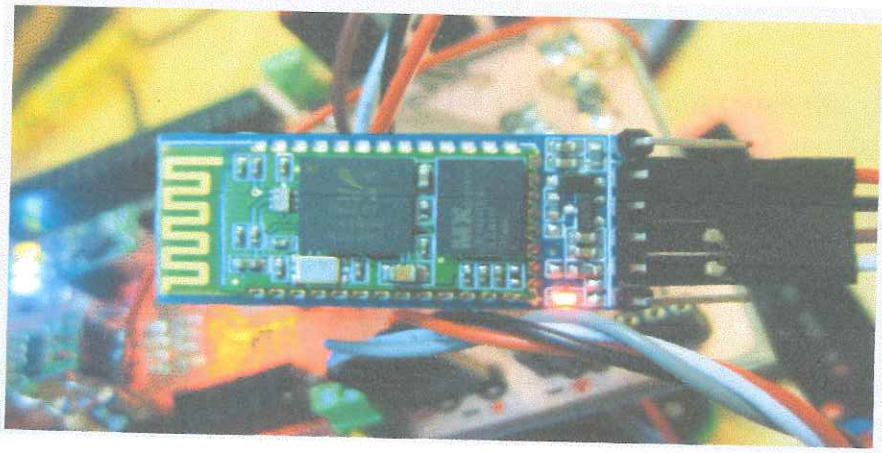

Figure 2.4.5: Bluetooth Device

2.4.6 Parts included in the kit:

1) RoboEye Module
2) Video receiver

2.4.8 Electrical Specification:

1) Power supply: RoboEye-9VDC (2 recommended)
2) RoboEye Module: (port provides 12V and 200 mA to run the hardware) and RoboEye Supply Current: 50 mA (typical)
3) I/O Line Voltages: Maximum 5V input voltage; 3V output voltage (logical high); 0.3V output voltage (logical low)
4) Serial Communication: UART, 9600 Baud, 8 bit data, 1 stop bit with 26 byte buffer Frequency: 2400 – 2524 MHz with 16 different channels (jumper configured).

2.4.9 Power Supply

2.4.9.1 Dry Dells

-Supply voltage to the circuit operations

Figure 2.4.9.1: Battery 9V

2.4.10 Hardware

1) Processor: Arduino Uno, 32MB SDRAM, 4MB Flash, JTAG

2) Camera: Omni vision OV9655 1.3 megapixel 160x128 to 1280x1024 resolution

3) Sensors: 2 laser pointers for ranging, support for up to 4 Maxbotics ultrasonic ranging modules and various I2C sensors

4) Drive: Tank-style treads with differential drive via four precision DC gear motors (100:1 gear reduction)