Faculty of Information Technology

Automated Camera Stand

Group 47

P.A.U.D. Herath	**204074M**
P.H.P. Jayathilaka	204087F
D.M.B.M. Dissanayake	204047J
S.P.S.N. Pathirana	204150T
A.M.D.B. Rathnayaka	204179N

Supervisor's Name: Mr. B.H. Sudantha
Dean/Senior Lecturer
Faculty of Information Technology

Ms. Chanduni Gamage
Lecturer
Dept. of Information Technology

Signature of Supervisor: ……………………………. …………………………….

Date of Submission: 30/11/2021

Table of Content

Table of Figures

1 Introduction

Wildlife photography is a popular category of photography, done by beginners, enthusiasts, and professionals. When taken technically, it involves capturing any type of animal, from birds to insects to butterflies to mammals. But wildlife photographers most commonly take photos of mammals, reptiles, amphibians, and birds. Wildlife photography is a loosely defined profession that demands a passion for nature and art. These photographers make a career of traveling to remote areas and taking pictures of wild animals and natural scenery with a risk.[01]

Wildlife photographers are some of the world's most valued professionals. According to the U.S. Bureau of Labor Statistics, the average annual wage of most wildlife photographers was $50,290 per year, or $24.18 per hour, as of May 2020. So, this is a higher-paying job. Due to this reason, many new photographers have come to this field. And most wildlife photographers are freelancers. The amount of money that a freelance wildlife photographer makes is largely determined by his talent and ability to get decent-paying work. From all these things it is crystal clear that wildlife photography is one of the best careers in the world.

Wildlife photography is one of the most dangerous professions in the world. The following instances are examples of the dangers which happen for wildlife photographers. One such incident happened in May of 2000 when a female wildlife photographer was attacked and partially eaten by a 112-pound female black bear in Tennessee. Last year in Colorado a wildlife biologist and photographer, Tom Mussel, got too close to a cow elk and her calf, and he was attacked when he stumbled as he tried to escape the charging cow. Elk and deer will attack humans when they feel cornered or threatened. A southern California man killed by a grizzly bear in Alaska's backcountry was shooting photos of the animal that killed him just moments before the attack, a National Park Service official said Sunday. The bear that killed Richard White, 49, was still with his body when rangers found him in Danail National Park, the official said. Photographs found in his camera revealed that White was watching the bear for at least eight minutes near a river before the attack [02].

From our project, we mainly focused on avoiding danger for the wildlife photographer and the safety of the camera. In this period many wildlife photographers are dying while taking photos due to animal attacks. We are going to introduce a new device to avoid such a problem.
It is an Automated Camera Stand.

2 Literature Survey

In modern cameras, we have the feature to take remote photos. We call it remote photography. Therefore, we can take pictures even if we are far from the camera. But there is no way to bring the camera near to the animals rather than a person carrying the camera.

From the photographer's side:

- Danger to the life of the photographer.
- Time wastage of the photographer.
- Can't find a good angle to take a photo.
- Can't get close enough to the animal.
- Constantly changing lighting conditions.
- No safety to the camera.

From the animal's side:

- Animals get scared when we try to reach them.
- The behaviors of the animals may change. From the environment side:
- Bad impact on biodiversity.

Therefore, when we try to find out a solution for this, we come across with some similar projects as following.

2.1 Beetle cam for wildlife photography

Beetle cam has designed to take wildlife photographs. Wildlife photographer Will Burrard-Lucas had long wanted to add up-close-and-personal images of iconic African animals to his portfolio. But to get those intimate shot of lions and leopards, he would need to crawl up right next to their sharp-toothed faces [03]

Figure 2-1 Beetle Cam

This beetle cam can move forward and backward by using the remote controller. And also, beetle cam can be turned by using the wheels.

2.2 VCT-VPR1 Remote Control Tripod

This tripod has been designed to hold a camera and this is controlled by a remote controller. This tripod can check vertical and horizontal alignment using a grid line button. And also bring the subject closer with the zoom controller in the remote.

In our product we have all the functionalities same as the beetle cam and the VCT-VPR1 Remote Control Tripod. But there are some uncommon functionalities rather than these products. In our project, there is a special feature that can move the camera to the location easily by using GPS location guiding and can avoid obstacles itself. And also, can rotate the camera vertically using the remote controller. There is a siren for the safety of the camera. Both these products are foreign products. And we were unable to find out a Sri Lankan product.

3 Aim & Objectives

3.1 Aim

This project aims to the distance photography process to make sure it is safer and effective.

3.2 Objectives

The objectives of the project are as follows,

- Rotate the camera both vertically and horizontally.
- Move the stand according to the given GPS coordinates.
- Reach the target safely.
- Protect the camera from the animals by using the alarm.
- Control the camera holder using a remote controller.

4 Analysis and Design

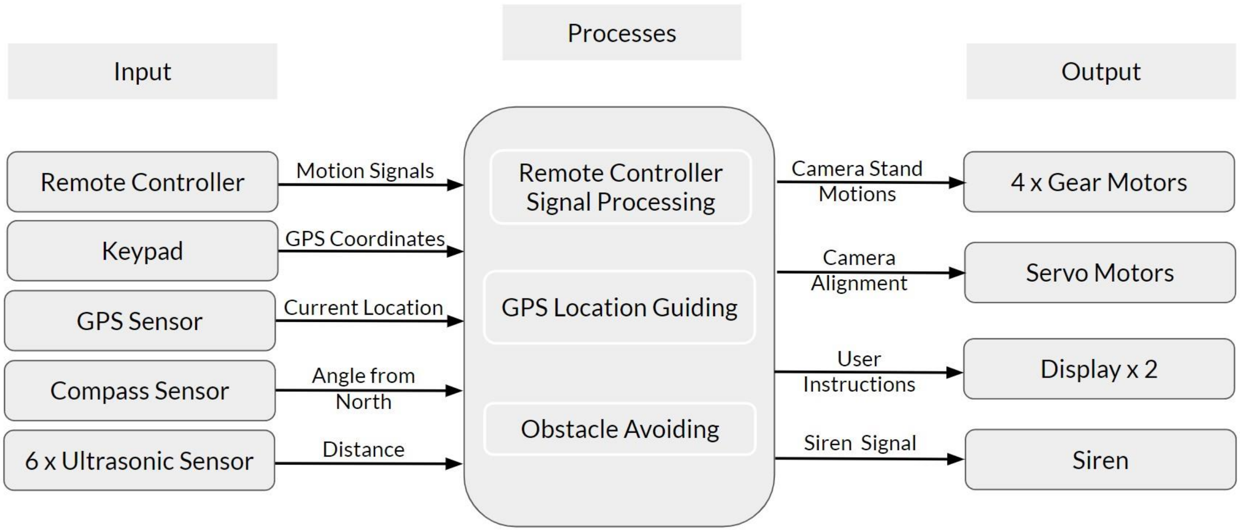


Figure 4-1 Block Diagram of Proposed System

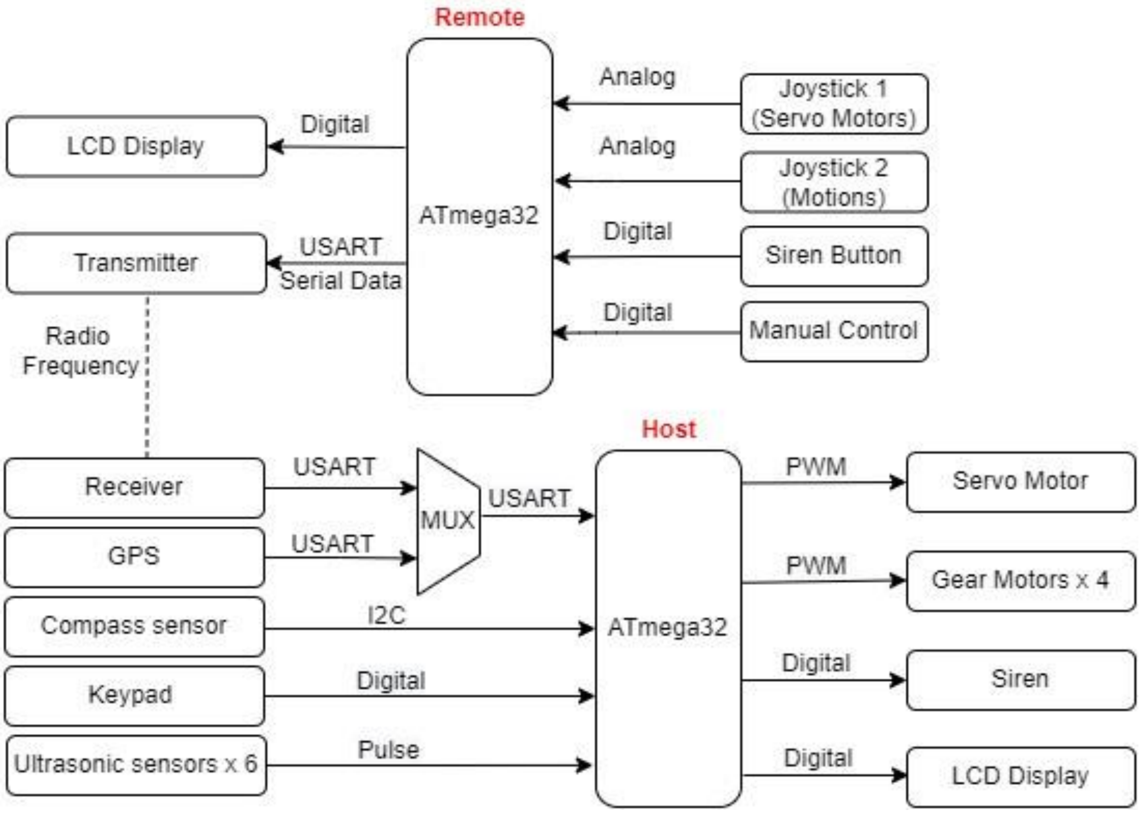


Figure 4-2 System Diagram of Proposed System

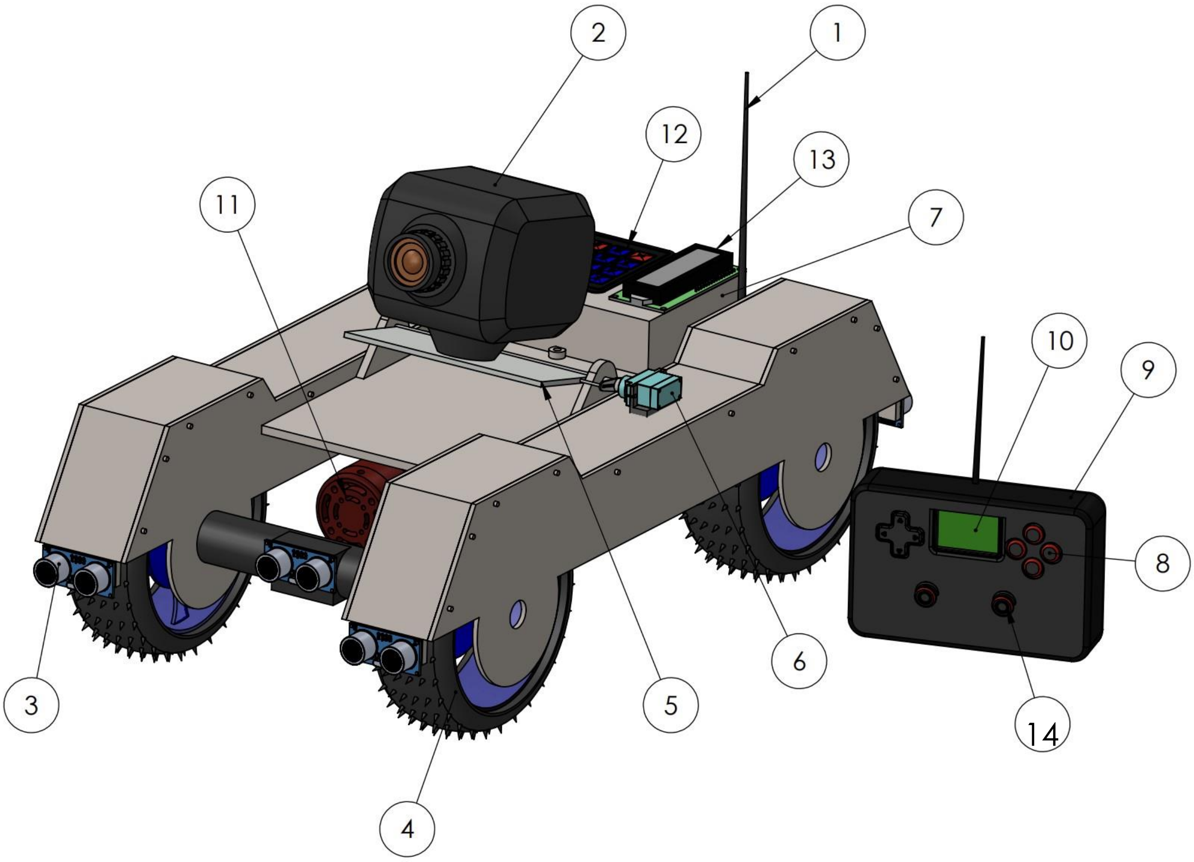


Figure 4-7 Named Camera Stand 3D view

1. RF Antenna
2. Camera
3. Ultrasonic sensors
4. Wheels with gear motors
5. Universal camera mount
6. Servo motor
7. Project box
    a. Atmega32 IC
    b. Compass sensor
    c. RF receiver
    d. GPS module
8. Remote controller buttons
9. Remote controller
10. LCD Display
11. Siren
12. 4x4 Numpad
13. LCD Display
14. Joystick

5 Testing and Implementation

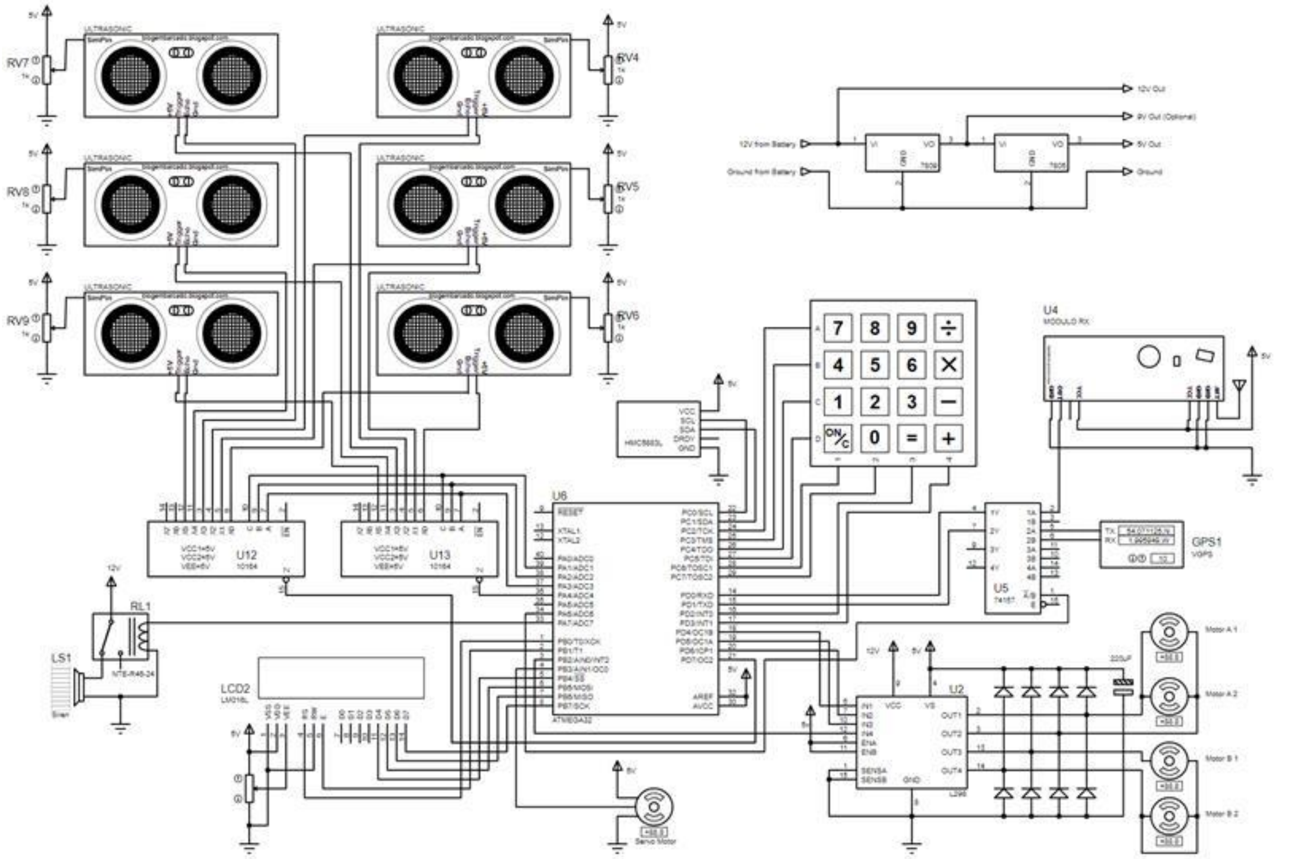


Figure 5-1 Schematic View of Circuit Diagram

In our project, there are two ATmega32 microcontrollers, one is for remote controller and the other one is for the host (Camera stand). The microcontroller takes inputs related to motions and angles from two joysticks. The microcontroller of the remote processes the data and transmits from remote to host through RF (Radio Frequency) modules.

Then the microcontroller of the host gets data from the RF receiver module and GPS module using a 2×1 multiplexer. And also, the microcontroller of the host takes inputs from ultrasonic sensors, compass sensor, and the keypad. The microcontroller of the host processes that data and send data to the servo motors and gear motors. And also send digital signals to the display and the siren.

5.1 Thumb Joystick

Joystick is an input device. It is used to control the pointer movement in 2-direction axis. It is made by mounting two potentiometers at a 90 degrees angle to read user’s input. The potentiometers are connected between +VCC and Ground. They simply behave as voltage divider network. The joystick has one freewheeling holder. According to the holder movement, the potentiometer knob changes its position and resistance of the potentiometer. This module produces an output of around 2.5V from X and Y when it is in resting position. The output varies from 0v to 5V depending on its direction according to the holder movements. If this module connect to a microcontroller, then can expect to read a value of around 512 in its resting position. Operating Voltage is 5V. Operating current is 3.5 mA. Internal potentiometer value is 10kΩ. Operating Temperature is 0 to 70°C. There are five pins such that Ground pin, Vcc, VRx, VRy and Switch pin. In the project, thumb joysticks are used to get the analog output voltage related to move the camera stand forward backward, to get the analog output voltage related to move the camera stand left right and to give the analog inputs to the servo motor related to changing the angle.

5.2 Liquid Crystal 16 × 2 Display

LCD displays are used to show GPS coordinates and the current remote's configurations. By using this LCD display, the camera stand becomes more user friendly. The LCDs have a parallel interface that the microcontroller has to manipulate several interface pins at once to control the display.

The interface consists of many numbers of pins. A register selection (RS) pin that controls writing data in the LCD's memory. There is a capability of selecting either the data register, which holds what goes on the screen, or an instruction register, which is where the LCD's controller looks for instructions on what to do next. There is a pin named Read/Write (R/W) to select the reading mode or writing mode and has an enable pin that enables writing to the registers. There are 8 data pins (D0 -D7). The states of these pins (high or low) are the bits that user is writing to a register when write, or the values user is reading when read. There is a display contrast pin (Vo), power supply pins (+5V and GND) and LED Backlight pins that can use to power the LCD, control the display contrast, and turn on and off the LED backlight, respectively. The process of controlling the display involves putting the data that forms the image of what user wants to display into the data registers, then putting instructions in the instruction register.

5.3 Motor drive

Motor drive is used to amplify the PWM signal from the Atmega32 and supply it to the gear motors. This drive can handle up to 50V and a maximum of 2.5A. Maximum logical supply and enable voltages are 7V. This is a dual full-bridge driver. So, both sides can be handled by a single drive. Pin configuration is quite simple. There are two input pins, two output pins and a single enable pin for each side.

5.4 Servo Motor

Servo motor is used to change the vertical angle of the camera within 90 degrees. A servo motor is an electromechanical device that produces torque and velocity based on the supplied current and voltage. A servo motor works as part of a closed loop system providing torque and velocity as command from a servo controller utilizing a feedback device to close the loop. The feedback device supplies information such as current, velocity or position to the servo controller, which adjusts the motor action depending on the command parameters. When taking a photo of a wild animal, have to change the direction of the camera according to the direction of the animal.

When the signal is received to the Atmega32 microcontroller in the host, it provides a signal to the servo motors to make the correct angle of the servo motors. To process that we use the PWM method.

Servo motor has three wires with different. The red colour wire should be connected to the power supply. Brown colour wire connects to the Ground and the orange colour wire connects to the PWM signal given by the Atmega32 in the host. These are the specifications of the servo motor, speed is 0.1 per second, torque is $2.5kgcm^{-1}$, weight is 14.7 g and operating voltage is 4.8V to 6V.

5.5 Siren

The siren is used to protect the camera stand. When the wild animals come to attack the camera stand, then sound the siren to run off the animals. The specifications of the siren are the operating maximum voltage is 12V, operating maximum current is 6A, sound intensity is 112 -116 decibels, and the speed is 1000 rpm.

5.6 RF Receiver and Transmitter

In this project there is a 433 MHz RF module to maintain communication between the remote controller and the host. RF module, as the name suggests, uses radio frequency to send signals. These signals are transmitted at a particular frequency and a baud rate. A receiver can receive these signals only if it is configured for that frequency. The transmitter module takes serial input and transmits these signals through RF.

The transmitter module consists of four pins namely Vcc, Ground, ATAD, and optional ANT pin as shown. The Vcc pin has a wide range of input voltage from 3V to 12V. The transmitter consumes a minimum current of 9mA and can go as high as 40mA during transmission. The ATAD pin is the data pin to transmit the signal. This signal modulated and then sent on air at a frequency of 433MHz. This module has an antenna pin which helps to connect the external wire to extend the range up to 100 meters. The size of the antenna will depend on the operating frequency.

The RF transmitter receives serial data and transmits it wirelessly through its RF antenna. The transmission occurs at the rate of 1 Kbps to 10 Kbps.

RF receiver gets signal from the RF transmitter and gives data to the microcontroller. The receiver module receives the data in the form of a signal and sends it to the data pin. The data received by the module is always in an encoded form which can be decoded by using the microcontroller. Receiver operating voltage is 3V to 12V. Receiver operating current is 5.5mA. And the operating frequency is 433 MHz. There are five pins such that Vcc pin, GND pin, two Data pins and antenna pin.

5.7 Gear motor

A gear motor is an all-in-one combination of a motor and gearbox. The addition of a gear head to a motor reduces the speed while increasing the torque output. The most important parameters regarding gear motors are speed (rpm), torque and efficiency. To select the most suitable gear motor load, speed and torque required for the application have to be measured correctly. Most DC motors can be complemented with unique gearheads.

By considering all these features in the gear motor, it’s better to use that type of motor for the wheels of the camera holder. [2]

5.8 Ultrasonic sensor

An ultrasonic sensor is an electronic device which measures the distance to an object by emitting an ultrasonic sound wave and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound. Ultrasonic sensors have two parts as the transmitter and receiver. Transmitter sends an ultrasonic sound wave and then the receiver receives that wave and calculate the time took to come back to the receiver. And using these data, ultrasonic sensor calculates the distance which has to that particular object. This is the way how the ultrasonic sensor works.

By considering all these features of the ultrasonic sensor it can be used to detect obstacles.[7]

5.9 4x4 Keypad

The working voltage of the keypad is 5V. This consists of four rows and four columns and due to that there are sixteen buttons too. Keypad is used to take GPS coordinates as the user inputs from the user.

5.10 NEO -6M GPS module

The GPS module uses the USART technology to communicate with the microcontroller. And when taking the specifications of the GPS module, the operating voltage lies between 2.7V to 3.6V. In the GPS module, there is a GPS antenna to take GPS signals through Radio Frequency which are sent from the GPS satellites. Its serial baud rate lies between 4800 bits per second to two lakhs thirty thousand four hundred bits per second. But the default serial baud rate is nine thousand six hundred. The max supply current for this module is 67 mA.

When taking the pin configuration of the GPS module, there are 4 pins. Vcc pin is for power supply and GND pin is used to ground the GPS module. TXD pin is for the transmission of data and the RXD pin is for the receiving of data. In this project, the only target is to transfer data from the GPS module to the Atmega32 chip, and therefore it is only needed to connect the TXD pin of the GPS module with the atmega32 RXD pin. RXD pin is the 14^{th} pin. This is all about the pin configuration of the GPS module.

5.11 Compass sensor

For the GPS location guiding algorithm, identifying the current facing direction of the camera stand is a must. The module used is the HMC5883L magnetometer module. This uses the I2C protocol for communication with the Atmega32 microcontroller. According to the documentation, the supply voltage for the magnetometer module lies between 2.7 V to 6.5 V. The max voltage is 6.5 V. The frequency to pass serial data is up to 400kHz and the operating temperature is between -22 to 185 Fahrenheit. The pin configuration is that there are 5 pins in the magnetometer module. The Vcc pin takes power to the module, and the GND pin is to ground. SCL is the serial clock pin, and the SDA is the serial data pin. DRDY is the data-ready interrupt pin.

6 Previous Action Plan

Action Plan

#	Responsible group member	Task	Duration	Start Date	End Date	Completion Date							
						20/09/2021	27/09/2021	4/10/2021	11/10/2021	18/10/2021	25/10/2021	1/11/2021	8/11/2021
1	204074M	GPS sensor	2 week	20/09/2021	3/10/2021								
		Compass sensor	2 week	4/10/2021	17/10/2021								
		GPS location guiding	3 week	01/11/2021	21/11/2021								
2	204087F	Ultrasonic sensors	3 week	20/09/2021	10/10/2021								
		Gear motors with wheels	1 week	11/10/2021	17/10/2021								
		Obstacle Avoiding	2 week	18/10/2021	31/10/2021								
		Motor Controlling	3 week	01/11/2021	21/11/2021								
		LCD display	1 week	18/10/2021	24/10/2021								
		Keypad	1 week	25/10/2021	31/10/2021								
3	204047J	First Joysticks - For servo motors	3 week	20/09/2021	10/10/2021								
		RF Transmitter	3 week	11/10/2021	31/10/2021								
		Programming	3 week	1/11/2021	21/11/2021								
4	204150T	Servo motors	2 week	20/09/2021	03/10/2021								
		Alarm	2 week	04/10/2021	17/10/2021								
		Triger Alarm	2 week	18/10/2021	31/10/2021								
		Servo Controlling	3 week	01/11/2021	21/11/2021								
5	204179N	Second Joystick - For motions	3 week	20/09/2021	10/10/2021								
		RF Receiver	3 week	11/10/2021	31/10/2021								
		Programming	3 week	1/11/2021	21/11/2021								

7 Action Plan for Remaining Work

Action Plan

	Responsible group member	Task	Duration	Start Date	End Date	Completion Date					
						31/12/2021	31/1/2022	1/2/2022	1/3/2022	1/4/2022	9/5/2022
1	204074M	Compass sensor	1 month	31/12/2021	31/1/2022						
		GPS location guiding	1 month	1/2/2022	1/3/2022						
		Test and implementation	2 months	2/3/2022	9/5/2022						
2	204087F	Obstacle Avoiding	1 month	31/12/2021	31/1/2022						
		Motor Controlling	1 month	1/2/2022	1/3/2022						
		Test and implementation	2 months	2/3/2022	9/5/2022						
3	204047J	First Joysticks - For servo motors	1 month	31/12/2021	31/1/2022						
		RF Transmitter	1 month	1/2/2022	1/3/2022						
		Test and implementation	2 months	2/3/2022	9/5/2022						
4	204150T	Servo motors	1 month	31/12/2021	31/1/2022						
		Test and implementation	1 month	1/2/2022	1/3/2022						
		Trigger Alarm	1 month	2/3/2022	1/4/2022						
		Servo Controlling	1 month	2/4/2022	9/5/2022						
5	204179N	Second Joystick - For motions	1 month	31/12/2021	31/1/2022						
		RF Receiver	1 month	1/2/2022	1/3/2022						
		Test and implementation	2 months	2/3/2022	9/5/2022						

Appendix A

8 Cost Estimation and Expenditure so far

Component	Unit Price	Quantity	Price (LKR)
68mm RC Car Tire Wheel	Rs. 300.00	4	Rs. 1,200.00
Liquid Crystal 16x2 Display Module	Rs. 300.00	1	Rs. 300.00
2 Pin Switch	Rs. 15.00	2	Rs. 30.00
Thumb Joystick Module	Rs. 150.00	2	Rs. 300.00
RF 433MHz Transmitter/Receiver	Rs. 200.00	1	Rs. 200.00
GY-271 Electronic Triple Axis Compass Module	Rs. 700.00	1	Rs. 700.00
Membrane Keypad - 16 Key	Rs. 180.00	1	Rs. 180.00
HC-SR04 Ultrasonic Sensor Module	Rs. 200.00	6	Rs. 1,200.00
NEO-6M GPS Module	Rs. 1,850.00	1	Rs. 1,850.00
L298N DC Motor Driver Module	Rs. 350.00	2	Rs. 700.00
Servo Motor	Rs. 750.00	1	Rs. 750.00
Atmega32 Microcontroller	Rs. 550.00	2	Rs. 1,100.00
11.1V 2200mAh 3S 25C Li-Po Battery	Rs. 2,800.00	1	Rs. 2,800.00
12V 2000mAh Li-Po Battery	Rs. 1,750.00	1	Rs. 1,750.00
DC Gear Motor 12v 180 RPM	Rs. 950.00	4	Rs. 3,800.00
		Total	Rs. 16,860.00

[4],[5]

9 Individual Contribution to the Project

9.1 P.A.U.D. Herath - 204074M

I studied about the GPS module. Studied about the way how the GPS signals generate, and the way GPS works. Learned about the theory regarding the USART communication. Understood the theory behind the multiplexer to connect the GPS module and the compass sensor module.

9.1.1 GPS module (NEO-6M)

The GPS module has a GPS antenna, battery, an EEPROM and a position fix LED indicator. The pins in the NEO-6M are Vcc, Tx, Rx and GND. Understood that the D0 and D1 pins must be used to take the serial data using the GPS module. Specifications are that the operating voltage is 2.7V - 3.6V. The serial baud rate lies between 4800 and 230400. The default baud rate is 9600. The operating current of the NEO-6M GPS module is 45mA.

9.1.2 Multiplexer

When taking the inputs related to the GPS module and the receiver, I had to use the same pins D0 and D1. Therefore, I used a multiplexer to carry this out.

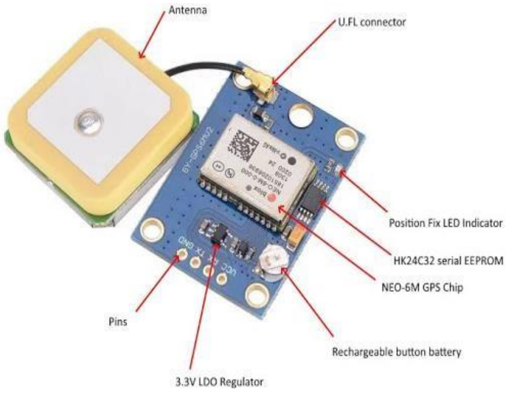


Figure 9-1 GPS Module NEO -6M

9.1.3 USART communication

To take the serial inputs from the GPS module, I used the USART method.

```
void UART_init(long USART_BAUDRATE);
unsigned char UART_RxChar();
void UART_TxChar(char ch);
void UART_SendString(char *str);

int main()
{
    char c;
    UART_init(9600);  //setting the baud rate to 9600Mbs

    UART_SendString("\n\t Echo Test ");
    while(1)
    {
        c = UART_RxChar();
        UART_TxChar(c);
    }
}

//Initialize the USART
void UART_init(long USART_BAUDRATE)
{
    UCSRB |= (1 << RXEN) | (1 << TXEN);  //Turn on transmission and reception
    UCSRC |= (1 << URSEL) | (1 << UCSZ0) | (1 << UCSZ1); // Use 8-bit character sizes
    UBRRL = BAUD_PRESCALE;      //Load lower 8-bits of the baud rate value
    UBRRH = (BAUD_PRESCALE >> 8);   // Load upper 8-bits
}
```

Figure 9-3 USART Sample Code

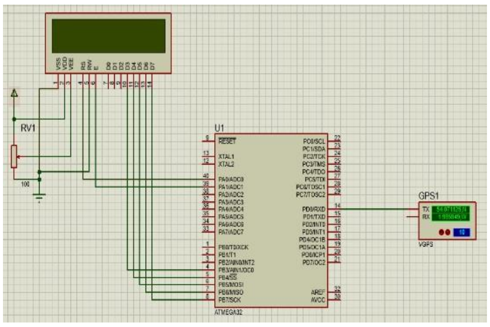


Figure 9-2 GPS Module Proteus Schematic View

9.2 P.H.P. Jayathilaka 204087F

I have studied about ultrasonic sensors, display, keypad, ADC, PWM. I have started studying about USART. Also, started to study interfacing components with the ATmega32 microcontroller and how to connect components to the microcontroller.

9.2.1 Ultrasonic sensor (HC-SR04)

I am using 6 ultrasonic sensors to avoid obstacles. There are 4 pins in the ultrasonic sensor. (VCC, Trig Pin, Echo Pin, GND)

The working power of the ultrasonic sensor is DC 5V and operating current 15mA. The working frequency is 40Hz, accurate range is 2cm – 40cm, the measuring angle is 15 degrees, trigger input signal is 10µS TTL pulse echo output signal input TTL lever signal and the range in proportion.

9.2.2 Gear Motors

Due to lack of eight PWM pins for four motors, I had to couple motors as left and right. Then needed PWM pins reduced to four. Furthermore, I used only one PWM pin and a digital pin per side. It is configured by code.

The working voltage is 12V DC. Speed is 180 RPM. It is a high torque motor and using L298NH – bridge motor drive.

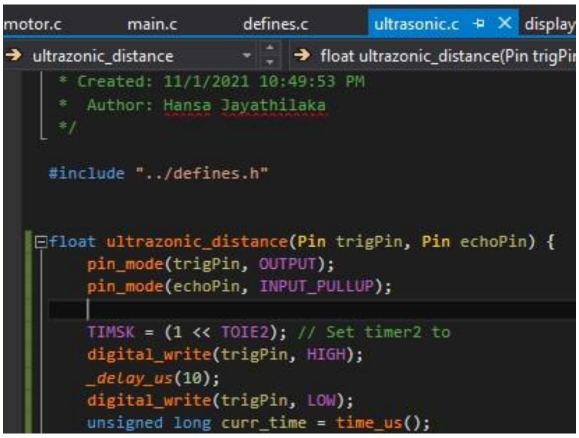


Figure 9-4 Sample Code of Ultrasonic Sensor

Figure 9-5 Sample Code of PWM

9.3 D.M.B.M. Dissanayake - 204047J

I have studied about Joystick, RF Transmitter and ADC. I have started to study interfacing components with the ATmega32 microcontroller and how to connect components to the microcontroller.

In our project, I used a joystick to get inputs related to the angle of servo motors. The microcontroller of the remote gets analog inputs from this joystick. We need knowledge about ADC on AVR ATmega32 to process that analog signal. To get this analog input, I had to use A0 pin in the ATmega32 microcontroller. Furthermore, I used a 433 MHz RF transmitter to transmit the above-processed data from the microcontroller.

9.3.1 Thumb Joystick

There are 5 pins in the joystick module. There are VCC, GND, VRx, VRy, SW.

The operating voltage is 5V. Internal potentiometer value is 10kΩ and the operating Temperature is 0 to 70 °C.

There is no joystick module in proteus. Therefore, I used a variable resistor to connect with the microcontroller.

Figure 9-6 Thumb Joystick Physical View

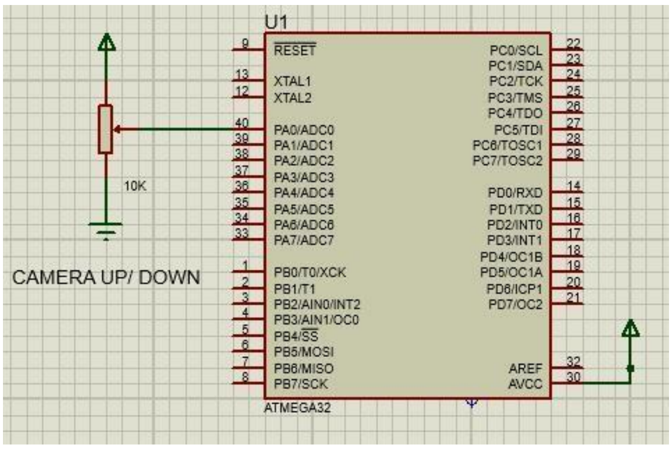
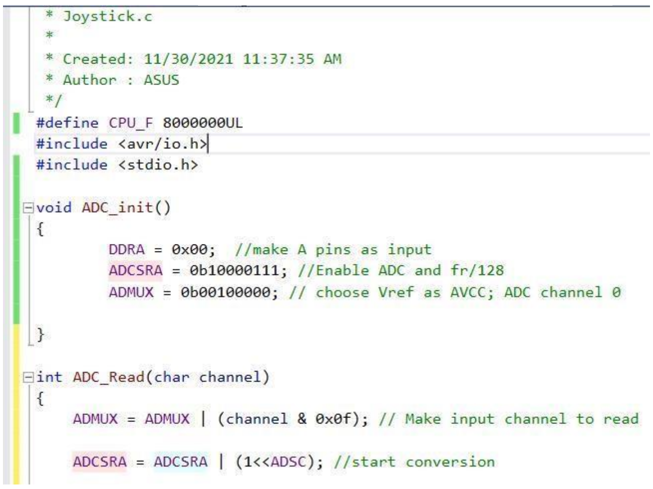


Figure 9-7 Use Variable Resister for Joystick



```
 * Joystick.c
 *
 * Created: 11/30/2021 11:37:35 AM
 * Author : ASUS
 */
#define CPU_F 8000000UL
#include <avr/io.h>
#include <stdio.h>

void ADC_init()
{
        DDRA = 0x00;  //make A pins as input
        ADCSRA = 0b10000111; //Enable ADC and fr/128
        ADMUX = 0b00100000; // choose Vref as AVCC; ADC channel 0

}

int ADC_Read(char channel)
{
    ADMUX = ADMUX | (channel & 0x0f); // Make input channel to read

    ADCSRA = ADCSRA | (1<<ADSC); //start conversion
```

Figure 9-8 ADC configuration and Read

9.4 S.P.S.N. Pathirana 204150T

As a member of our group, I have to work with a servo motor and a siren. I studied about the servo motor, and the siren. Then, I selected a suitable type of servo motor and a siren. After that, I started to learn about how they are working and interfacing with Atmega32 microcontroller.

In this project, servo motor is used to change the vertical angle of the camera, according to signal of the joystick.

9.4.1 Servo Motors

These are the specifications of servo motor: The speed of the servo motor is 0.1 per second. The torque is 2.5 kg/cm. The weight is 14.7g and the voltage is 4.8V – 6V.

```c
#define F_CPU 8000000UL // 8 MHz clock speed
#include <avr/io.h>
#include <util/delay.h>

int main(void)
{
    DDRC = 0x01; //Makes RC0 output pin
    PORTC = 0x00;

    while (1)
    {
        //Rotate Motor to 0 degree
        PORTC = 0x01;
        _delay_us(1000);
        PORTC = 0x00;

        _delay_ms(2000);

        //Rotate Motor to 90 degree
        PORTC = 0x01;
        _delay_us(1500);
        PORTC = 0x00;

        _delay_ms(2000);
```

Figure 9-10 Sample Code of Servo Motors

9.4.2 Siren

We used a siren to protect the camera stand. When the wild animals come to attack the camera stand, we just sound the siren to run off the animals. The siren sounds according to the signal given by the siren button in the remote controller.

These are the specifications of the siren, operating maximum voltage is 12V, operating maximum current is 6 A, sound intensity is 112 -116 decibels, and the speed is 1000 rpm.

Figure 9-12 Physical View of Siren

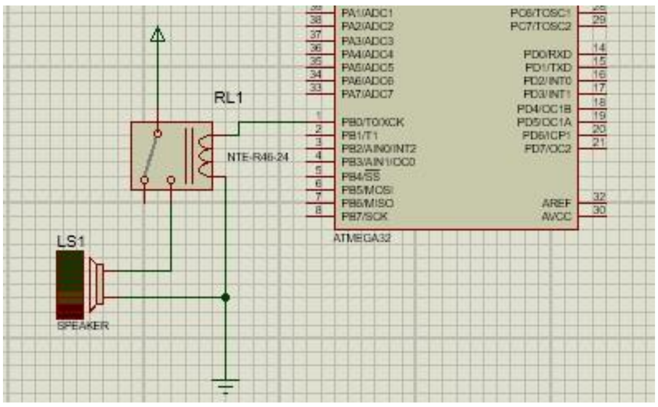


Figure 9-11 Siren Proteus schematic view

9.5 A.M.D.B. Rathnayaka 204179N

I studied about the joystick, RF receiver, ADC Technology and started to learn about how the components are working and interfacing with ATmega32 microcontroller. In our project, I have to give inputs to the ATmega32 microcontroller of the remote from the joystick. Moreover, it gives inputs to the microcontroller of the host from the RF receiver.

9.5.1 433 MHz Receiver

Receiver uses the USART communication to communicate with the Atmega32 microcontroller of the host. The operating frequency is 433 MHz, the operating voltage is 5V and the supply current is 3.5 mA.

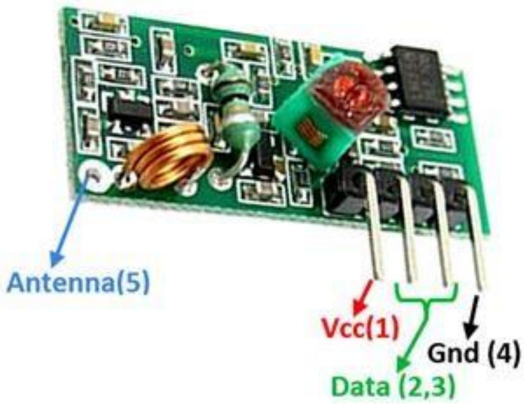


Figure 9-13 RF Receiver Physical view

9.5.2 Thumb Joystick

There are 5 pins in the joystick module. And the pins in this module are VCC, GND, VRx, VRy, SW. The Operating Voltage is 5V. The Internal potentiometer value is 10kΩ and the operating temperature is 0 to 70 C̊. There is no joystick module in proteus. Therefore, I used two variable resistors to connect with the microcontroller.

```
/*
 * Joystick my code.c
 *
 * Created: 12/2/2021 2:53:05 PM
 * Author : dasur
 */

#define F_CPU 8000000UL
#include <avr/io.h>
#include <util/delay.h>
#include <stdlib.h>
#include <stdio.h>


void ADC_Init()
{
    DDRA = 0X0;  /*Make ADC port as input*/
    ADCSRA = 0b10000111;  /*Enable ADC,fr/128*/
    ADMUX = 0b01100001;   /*V ref:AVcc, left justified, ADC channel 1 */
    ADMUX = 0b01100010;  /*V ref:AVcc, left justified, ADC channel 2 */
}
```

Figure 9-14 ADC initializing code

Appendix C

References

[1] A. Duke, "Hiker photographs bear just before fatal grizzly attack," *CNN*, 26-Aug-2012.

[2] "DC Motor & DC Gear Motor Basics | ISL Products International Ltd.", *ISL Products International*, 2022. [Online]. Available: https://islproducts.com/design-note/dc-motor-dc-gear-motor-basics/.

[3] J. Dempsey, "Introduction to wildlife photography: A guide for beginners," *Phototraces.com*, 03-Jan-2020. [Online]. Available:
https://www.phototraces.com/b/wildlife-photography/.

[4] M. Gallucci, "These robots are transforming how we see wildlife," *Mashable*, 12-Jan2017. [Online]. Available: https://mashable.com/article/robots-wildlife-photography.

[5] "Microchip.lk – one stop for all your electronics…," *Microchip.lk*. [Online]. Available: https://microchip.lk/.

[6] "TRONIC.LK," *Lankatronics.com*. [Online]. Available: https://lankatronics.com/.

[7] "What is an Ultrasonic Sensor?", *Fierce Electronics*, 2022. [Online]. Available: https://www.fierceelectronics.com/sensors/what-ultrasonic-sensor.