PARALYZED PATIENT CARE SYSTEM

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Abstract - It is well recognized that the lack of mobility is one of the most limiting disabilities. Individuals who don't have their legs, or who haven't capability of mobility. So for that purpose, this project we have chosen. Without a means to free move around, they are totally dependent on others therefore it is their priority to be able to mechanically move their bodies under their own command. Presently there are different techniques such as manually control, voice control, brain control developed to move wheelchair but what if he is unable to move his either body part with assumption of this we have designed wheelchair movement using eye blink. IR sensor used to detect eye blink of patient and based on which we have controlled wheelchair. Also we use GSM and GPS technologies for patient tracking system.

I. INTRODUCTION

Paralyzed patient can move his body with the help of this wheelchair. Eye blink is monitored continuously and based on which control signal is made which can help him to move in either direction. Microcontroller works on these control signals and decide movements. There are four movements we have decided as LEFT, RIGHT, FORWARD and BACKWARD. The couple of gear motor wheels make mechanical movement, motor driver takes input control signals from microcontroller and direct each motor respectively.

The reasons for such decreased motion possibilities can be different: stroke, arthritis, high blood pressure, degenerative diseases of bones and joints and cases of paralysis and birth defects. Also, quadriplegia appears as a consequence of accidents or age. The patients with such severe disabilities are not able to perform their everyday actions, such as: feeding, toilette usage and movement through space.

Depending on the severity of the disability, a patient can retain freedom of movement to a certain level by using different medical devices. Available medical devices designed to help them are very complicated, rare and expensive. Hence, for those peoples we decide to design such system or a device that will helpful for them for mobility around the environment which is less complicated and less expensive. So, to bring this concept in practice, we searched the information about such type of concept on internet, and on internet we got various systems by which we can design such system.

In present the technology available in the market or day to day life to use the wheelchair are as follows:

1) Manual Wheelchair: In this the user or the patient drive the wheelchair by using his hands or other person can push the wheelchair from behind.
2) Voice Recognition Wheelchair: In this the user have to speak and by using this voice the wheel chair is moved.
3) Mind Control Wheelchair: In this the user have to think the instructions and by using the pulses of brain the wheelchair is moved

Here we decide to take advantage of IR technology for those people who can only blink their eyes. The IR transmitter-receiver pair is used.

IR rays are bombarded in eyes and when patient blinks eye then that IR rays reflect back which are received by Photodiode. According to blinking of two eyes the interrupts such as left, right, forward, reverse is generated. Microcontroller gives signal to Motor Driver & it will drive the motors of wheelchair according to code word.

A GSM and GPS based tracking system also included to make it worry free system i.e. their family member/colleagues can track him about his current movement and position. Hence we can say it as pretty good care system for paralyzed patient.

Microcontroller 89S52 introduced by Atmel used for control system, SIM900A com. GSM/GPRS board used for massage sending, it works on AT commands. GPS hardware provides the information about current latitude and longitude to microcontroller. RF media used over 433 Mhz frequencies to send eye blink commands. All this hardware embedded to complete work this module of wheelchair embedded system.

II. BLOCK DIAGRAM

Fig. 1 shows basic block diagram of paralyzed patient care system consist of

1. Microcontroller
2. RF transmitter
3. RF receiver
4. Left, Right and Rear IR sensor
5. Goggles frame
6. GSM module
7. GPS module
8. Motor driver
9. Gear DC motor
10. Power section

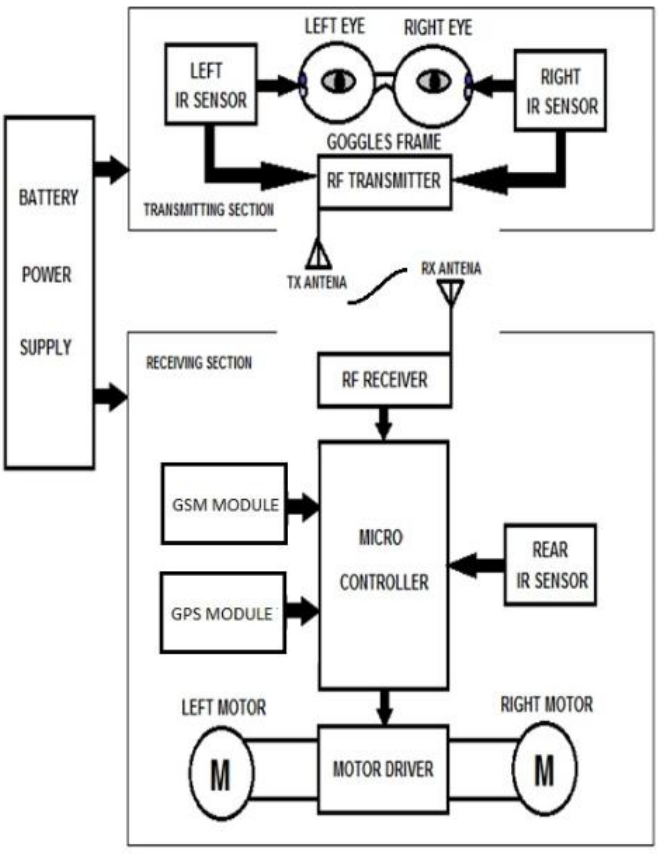

Fig. 1 Block diagram of paralyzed patient care system

III. HARDWARE REQUIREMENT

1. Microcontroller
2. RF Transmitter and Receiver module
3. IR sensor
4. GSM module
5. GPS module
6. Motor driver and motors

A. Microcontroller

Microcontroller is heart of all system. It controls overall process in the system. It makes possible communication between all hardware. It continuous monitors IR sensor signals and make decision based on received IR data. It issues all wheelchair movement related commands.

Microcontrollers also read current geo location of patient from GPS and send it over GSM. Here we have used AT89S52 microcontroller it has specifications as:

1) 8K Bytes of In-System Programmable (ISP) Flash Memory – Endurance: 10,000 Write/Erase Cycles.
2) 4.0V to 5.5V Operating Range
3) Fully Static Operation: 0 Hz to 33 MHz
4) Three-level Program Memory Lock
5) 256 x 8-bit Internal RAM
6) 32 Programmable I/O Lines
7) Three 16-bit Timer/Counters
8) Eight Interrupt Sources
9) Full Duplex UART Serial Channel
10) Low-power Idle and Power-down Modes
11) Interrupt Recovery from Power-down Mode
12) Watchdog Timer
13) Dual Data Pointer
14) Power-off Flag
15) Fast Programming Time
16) Flexible ISP Programming (Byte and Page Mode)

B. RF Transmitter and Receiver module

Radio frequency used for wireless communication. Transmitter and Receiver communicate over 433 MHz carrier frequency using ASK modulation technique. It has range of about 100meter subjected to LOS clearance.

It transmits IR sensor data of eye blink to microcontroller and require Encoder and Decoder at transmitter and receiver side respectively.

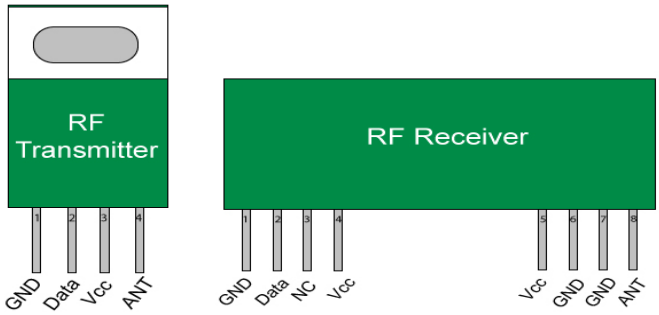

Fig. 2 RF module.

It has specification as:

1. Transmitter*:*

Working voltage: 3V - 12V max. power use 12V
Working current: max Less than 40mA max , and min 9mA
Resonance mode: (SAW)
Modulation mode: ASK
Working frequency: Eve 315MHz Or 433MHz
Transmission power: 25mW (315MHz at 12V)
Frequency error: +150kHz (max)
Velocity : less than 10Kbps

2. Receiver:

Working voltage: 5.0VDC +0.5V
Working current:≤5.5mA max
Working method: OOK/ASK
Working frequency: 315MHz-433.92MHz
Bandwidth: 2MHz
Sensitivity: excel –100dBm (50Ω)
Transmitting velocity: <9.6Kbps (at 315MHz and -95dBm)

C. IR Sensor

IR sensors are the most important part of this project as all control signals are dependent on IR.

The picture shown is a very simple black box model of the IR Sensor. The sensor emits IR light and gives a signal when it detects the reflected light.

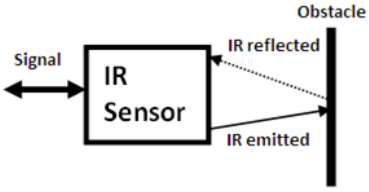

Fig. 3 IR Sensor

An IR sensor consists of an emitter, detector and associated circuitry. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, its resistance and correspondingly, its output voltage, change in proportion to the magnitude of the IR light received.

D. GSM Module

SIM900A GSM/GPRS module developed by Simcom is used for sending SMS over GSM. It has AT command set which is used for various functions like CALL, SMS and GPRS services. It receives AT commands from microcontroller of about sending concatenated message body.

Fig. 4 GSM Module

It has specification as follows:

1) Quad-Band 850/ 900/ 1800/ 1900 MHz
2) GPRS multi-slot class 10/8
3) GPRS mobile station class B
4) Compliant to GSM phase 2/2+ – Class 4 (2 W @850/ 900 MHz) – Class 1 (1 W @ 1800/1900MHz)
5) Dimensions: 24* 24 * 3 mm
6) Weight: 3.4g
7) Control via AT commands (GSM 07.07 ,07.05 and SIMCOM enhanced AT Commands)
8) SIM application toolkit
9) Supply voltage range 3.4- 4.5 V
10) Low power consumption
11) Operation temperature: -30 °C to +80 °C

E. GPS Module

GPS receiver continuously provides position related information, it simply receives low power high frequency signal form satellites and define each visible satellites distance from itself which called as trilateration and then calculate fixed data consisting of latitude, longitude, altitude etc. which we have converted in decimal format

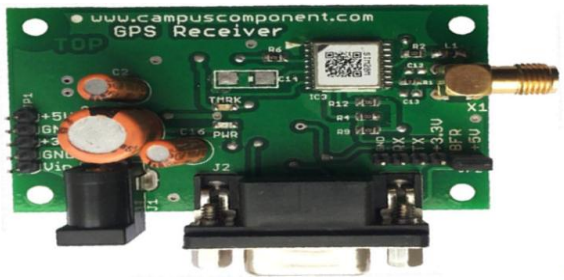

Fig. 5 GPS Module

It has specifications as

1) Operating Temperature: -40oC ~ +85oC
2) Storage Temperature: -55 ~ +100oC
3) 50 Hz update rates
4) Input Voltage: 3.3V DC +/-10%
5) Input Current: ~25mA tracking
6) Jamming detection and mitigation
7) Contains LNA, SAW Filter, TCXO,LDO
8) Dimension: 15mm L x 13mm W
9) Weight: 1.5g

F. Motor Driver and Motors

Motor driver L293D is quadruple high-current half-H drivers commonly used to drive inductive loads such as DC motor in either direction. We have 9V, 100rpm specific gear DC motors with wheels attached to shaft of each motor.

It has specifications as

1) Wide Supply-Voltage Range: 4.5 V to 36 V
2) Separate Input-Logic Supply
3) Internal ESD Protection
4) High-Noise-Immunity Inputs
5) Output current of 600mA per channel
6) Peak output current of 1.2 A per channel
7) Output clamp diodes for inductive transient suppression

IV. RESULT AND DISCUSSION

The working of care system in either direction is given in following sequence.

A. Sequence followed by system for Left eye blink in forward direction.

1. Patient close left eye.
2. Systems wait for 1.5 second to check whether it still closed or open.
3. After 1.5 second if relative eye remains closed then controller issues wheelchair forward movements command.
4. Microcontroller read latitude/longitude data from GPS.
5. Microcontroller issue AT command for GSM initialize and SMS body.
6. Microcontroller make message body of direction and GPS link
7. Microcontrollers send SMS to defined phone number.
8. Wheelchair start movement in forward direction.
9. Blink right eye to stop wheelchair movement in forward direction.

B. Sequence followed by system for Left eye blink in Left direction.

1. Patient close left eye.
2. If left eye opened before 1.5 second i.e. if there is just present left eye blink, then controller issue wheelchair left turn movement command.
3. Microcontroller read latitude/longitude data from GPS.
4. Microcontroller issue AT command for GSM initialize and SMS body.
5. Microcontroller make message body of direction and GPS link
6. Microcontrollers send SMS to defined phone number.
7. Wheelchair start movement to turn in left direction.
8. Blink any eye to stop wheelchair movement in left direction.

C. Sequence followed by system for Right eye blink in Backward direction.

1. Patient close right eye.
2. System wait for 1.5 second to check whether it still closed or open.
3. After 1.5 second if relative eye remains closed then controller issue wheelchair backward movements command.
4. Microcontroller read latitude/longitude data from GPS.
5. Microcontroller issue AT command for GSM initialize and SMS body.
6. Microcontroller make message body of direction and GPS link
7. Microcontroller send SMS to defined phone number.
8. Wheelchair start movement in backward direction.
9. Blink left eye to stop wheelchair movement in backward direction.

D. Sequence followed by system for Right eye blink in Right direction.

1. Patient close right eye.
2. If left eye opened before 1.5 second i.e. if there is just present right eye blink, then controller issue wheelchair right turn movement command.
3. Microcontroller read latitude/longitude data from GPS.
4. Microcontroller issue AT command for GSM initialize and SMS body.
5. Microcontroller make message body of direction and GPS link
6. Microcontrollers send SMS to defined phone number.
7. Wheelchair start movement to turn in right direction.
8. Blink any eye to stop wheelchair movement in right direction.

E. Rear obstacle detects system for Backward direction.

As paralyzed patient unable to move his body by self so he/she unable to see backside obstacles while wheelchair running in backward direction, hence for safety purpose there should be requirement of rear obstacle detect system.

IR sensor used with detecting sensitivity set over safety distance between wheelchair back and obstacle.

F. Flowchart of care system

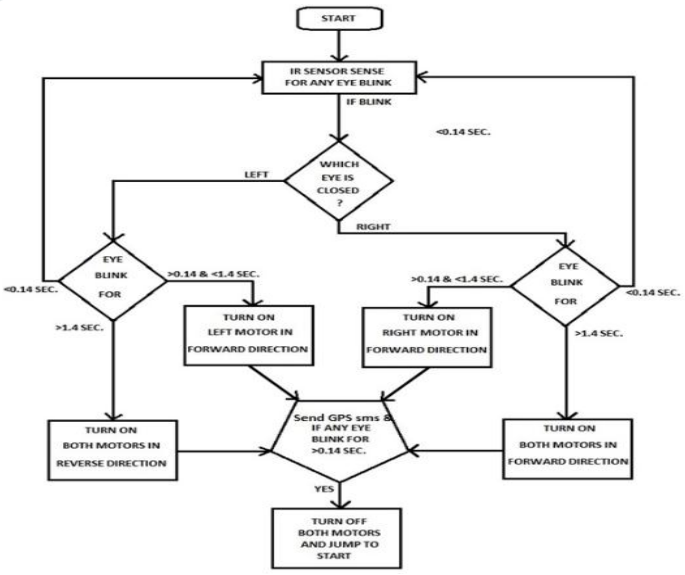

Fig. 6 Flowchart of care system

V. CONCLUSION

Nowadays technologies are emerging to a great extent that can build various flexible applications based on their needs and quality factor and we have seen and achieved the same here. Also our effort can make smile for them who are motionless.

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