SMART WHEEL CHAIR FOR PHYSICALLY CHALLENGED PEOPLE

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Abstract:

Based on the developing requirement of digitalization, networking, and intellectualization in smart home, an improved scheme of home appliance control system is proposed in this paper. It is focused on the system identification and information security. The software designed for smart phone and PDA(Personal Digital Assistant) based on Android operation system. The communication happens on UDP(User Data Gram Protocol) protocol based on IPv6 for WPAN(Wireless Personnel Area Network). The system helps physically challenged people to control home with click of a button on mobile phone. It provides easier access to their electrical appliances.

Index: PDA, UDP, WPAN, IPv6, Security

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I. INTRODUCTION:

Smart wheelchair is mechanically controlled device designed to have self mobility with the help of the user command. This reduces the human effort and force to drive the wheels for wheelchair. Furthermore it also provides an opportunity for visually or physically impaired persons to move from one place to another. Smart wheelchair has gained a lot of interest in the recent times. These devices are useful especially in transportation from one place to another. The machines can also be used in old age homes where the old age persons have difficulty in their movement. The devices serve as a boon for those who have lost their mobility.

A wheelchair is a wheeled mobility device in which the user sits. The device is propelled either manually (by turning the wheels by the hand) or via various automated systems. Wheelchairs are used by people for whom walking is difficult or impossible due to illness (physiological or physical), injury, or disability.

A wheelchair is a chair fitted with wheels. The device comes in variations allowing either manual propulsion by the seated occupant turning the rear wheels by hand, or electric propulsion by motors. There are often handles behind the seat to allow for different individuals to push. Wheelchairs are used by people for whom walking is difficult or impossible due to illness, injury, or disability. People who have difficulty sitting and walking often make use of a wheelbench. A basic manual wheelchair incorporates a seat, foot rests and four wheels: two, caster wheels at the front and two large wheels at the back. The two larger wheels in the back usually have hand-rims; two metal or plastic circles approximately 3/4" thick.

A wheelchair assists people to become more mobile and independent. There are many different types of wheelchairs that are used for various reasons. It is important to understand the limitations and safe operation of whatever wheelchair you choose.

The chair seat size (width and depth), seat-to-floor height, footrests/leg rests, front caster outriggers, adjustable backrests, controls, and many other features can be customized on, or added to, many basic models, while some users, often those with specialized needs, may have wheelchairs custom-built. This project is for physically challenged person, who is not able to use his legs for his movement. The person will be able to control the wheel chair movement through a joystick and control the home appliances from the android application through WPAN (Wireless Personal Area Network). In case of any emergency, user need to press emergency button, which enables the sound alarm and send a SMS (Short Message Service) to dedicated mobile number informing about emergency. For the demonstration purpose we are using robotic chassis as wheel chair. Also this project is based

on controlling a variety of home appliances using IOT. It combines network communication, information appliance, equipment automation etc. It integrates system, structure, service, and management into a safe, high-performance, and convenient living environment.

The project should physically challenge personal to control the home appliances from his wheel chair itself. The system should also enable physically challenged personal to control his wheel chair without much physically effort. The system should have emergency notification to hospital/doctor via a SMS service and alarm. The complete system should be modular so that it can be fitted easily onto the wheel chair. Also the home appliances can be controlled using application installed in mobile phone with the development of technology and the continuous improvement of people's living standard, people are in pursuit of automated, intelligent and convenient home control systems.

The popularity of smart phones, particularly, the phone based on android system is rapidly developed. At its I/O developer conference, Google showed a sneak preview of its android home project, which will extend the android platform into household objects. It means that the remote control based on android phone will become a mainstream way. After logging into the control interface, users can easily control the lights, TVs and air conditioning anytime, anywhere, which brings great convenience to people and improves their quality of life.

II. PROBLEM STATEMENT:

A handicapped person with locomotive disabilities needs a wheelchair to perform functions that require him/her to move around. He can do manually but this mode of operating is too tiring. Hence, it is desirable to provide them with a motorized smart wheelchair that can be controlled using joystick. People on wheel chairs encounter issues in controlling of the home appliances. It is difficult for them to get to a switch board which is at high position to turn on/off the appliances. They need to be dependent on one or the other person to do so. Thus, we chose to install the application on the phone with Wheel Chair And Home Appliance Control For Physically Challenged People Using WPAN 2018-2019 which the person can easily access control on the home appliances. In case of some emergency, the disabled person cannot rush to reach out his phone to drop a message for others need. So to avoid this, there is an emergency push button provided on the wheel chair. Once the person presses this push button an alarm gets activated and a SMS notification is sent.

An android application is developed, which gives feel of appliances to the user and control function. User will able to control the appliances from his wheel chair wirelessly without any hassle.

The wheel chair user is provided with a joystick using which he controls the wheel chair movement. The wheel

chair can be controlled in forward, reverse, left and right direction. An android application is provided on user phone to control the home appliances.

The Home appliances control circuit operates on 230V AC line. The supply is converted to DC voltage to provide power supply to the microcontroller. An ATMEGA 328P 8-bit RISC microcontroller is used in this application. The microcontroller gets data on through mobile IOT application on Wi-Fi device connected to microcontroller. The data is decoded and according relay is controlled, which in turn controls the electrical appliances.

III. PROPOSED SYSTEM:

The proposed system is a wheelchair (Robotic Model), which consists of a direction control circuit to control the wheel chair. A controller module consists of a joystick for controlling the wheel chair movement. It also consists of an audio alarm system along with SMS notification system. It's an android based application for controlling the home appliances via WPAN Technology. System also contains smart home appliances which can be controlled through Wi-Fi.

To develop a smart power wheelchair, whereby the term "smart" means a power wheelchair whose motion is mediated by a computerized system which is aware of the environment and can collaborate with the user to achieve mobility goals and avoid dangerous situations. Recognizing that the aging population has diverse and dynamic needs, we will also define and publicly release common hardware and software design platforms which will permit us and others to easily customize the wheelchair to individual users and adapt the wheelchair as the user ages. These platforms will also make it easier for researchers and commercial developers to add new capabilities, sensors and interfaces, as well as to migrate to new computer and wheelchair models as they become available.

The proposed system uses ATMEGA Microcontroller to implement its full functionality. The wheel chair user is provided with a joystick, using which the wheel chair movement is controlled. When user operates the joystick key, ARDUINO application detects the joystick movement and sends the data over 433 MHz transmitter through an encoder circuit. The wheel chair circuit consists of 433 MHz receiver module, which receives the transmitted codes from the main controller board. The decoder circuit decodes the data and controls the motor accordingly. The wheel chair can be controlled in forward, reverse, left and right directions. The DC motors of the wheel chair are controlled through L293D Module.

An android application is provided on user phone to control the home appliances. The home appliances are controlled though WPAN (Wireless Personal Area Network) Technology. A code over Wi-Fi is sent through the android mobile application. The code is received on an IOT (Internet of Things) Module, which is connected to the ATMEGA microcontroller through UART (Universal Asynchronous Receiver/Transmitter) Port. The

Microcontroller controls the home appliances through a relay circuit as per the commands received from the mobile application.

An emergency push button is provided on the wheel chair. Once the person presses this push button an alarm gets activated. This emergency button also activates SMS notification. The SMS feature is implemented in the system through SIM800 Module, which works on GSM (Global System for Mobile) mode. The SIM800 module communicates to microcontroller through UART (Universal Asynchronous Receiver/Transmitter) Port.

The electric powered wheelchair was said to be invented by George Klein who worked for the National Research Council of Canada, to assist injured veterans during World War II.A powerchair can be used by someone who hasn't got the dexterity or mobility, perhaps, to drive a mobility scooter due to arm, hand, shoulder or more general disabling conditions, and do not have the leg strength to propel a manual chair with their feet. EPWs can offer various powered functions such as tilt, recline, leg elevation, seat elevation, and others useful or necessary to health and function.

A motorized wheelchair, powerchair, electric wheelchair or electric-powered wheelchair (EPW) is a wheelchair that is propelled by means of an electric motor rather than manual power. Motorized wheelchairs are useful for those unable to propel a manual wheelchair or who may need to use a wheelchair for distances or over terrain which would be fatiguing in a manual wheelchair. They may also be used not just by people with 'traditional' mobility impairments, but also by people with cardiovascular and fatigue based conditions.

A powerchair user might also have special seating or arm and leg rest requirements that are better served by a powerchair than a mobility scooter.

The technology involved in electric wheelchairs is similar to that of mobility scooters and some powerchair manufacturers are offering models that look more like a mobility scooter than a traditional wheelchair.

Today you will find three general styles of electric powered chairs (EPWs): rear, center, front wheel driven or four wheel driven. Each style wheelchair has particular handling characteristics.

EPWs are also divided by seat type; some models resemble manual chairs, with a sling-style seat and frame, whereas others have 'captain's chair' seating like that of an automobile. EPWs run the gamut from small and portable models, which can be folded or disassembled, to very large and heavy full-featured chairs (these are often called 'rehab' chairs).

The user typically controls speed and direction by operating a joystick on a controller. Many other input devices can be used if the user lacks coordination or the use of the hands or fingers, such as chin controls and puff/sip scanners

Powerchairs are usually controlled by a joystick on the armrest which can be fitted on either armrest to suit left or right handed use.The arm rest can usually be swung out of the way so that the user can get closer to a desk or table for example.If a joystick control isn't appropriate for the user's needs, there are other methods of operating the powerchair, including a head controller, a sip and puff tube, fingertip control or foot control for those with C2-3 spinal cord lesions or head injuries (the user blows into a tube located near the mouth, which controls the movement of the chair).

A powerchair or electric wheelchair can bring independence and freedom to those currently reliant on others.Once you have decided on a powerchair rather than a mobility scooter or wheelchair, there are still plenty of other choices to be made. Including the price, the style and size of the powerchair, how portable the powerchair is, and how far it goes between charges.Traditionally power-chairs were not designed to be transported, and so were very difficult to dismantle. Nowadays, most electric wheelchairs are transportable, and some are very easy to dismantle. Powerchairs are using technology and features found on mobility scooters such as easy to remove battery packs, and easy to dissemble components that may mean the user doesn't need any additional help in order to transport or recharge the electric wheelchair.

Powerchairs are usually more customizable than disabled scooters, and can offer different types of control method and seating. For example, the range of the powerchair between charges may not be as important as it having an electric lift so that you can reach shelves or cupboards. It might be more important that it is available with a specialist seat, rather than dismantling to fit in the car.

Up until recently, electric wheelchairs were predominantly designed for indoor use, this has now changed as the technology and user requirements have changed. It is now possible to buy powerchairs that are equally suited to indoor and outdoor use.

Nowadays, electric wheelchairs are available with a range of well over 20 miles and a speed of up to 6 mph. These powerchairs come with outdoor style wheels and tires and look more rugged and suitable for outdoor use. They sometimes have additional rear wheels to aid stability when off road for example. These models are much more suitable for outdoor use than indoor use. Rear or mid wheel drive powerchair are the most popular and ideal for using outdoors as well as indoors.

If the powerchair is going to be used in the home as well as outdoors, it is important to ensure that the powerchair is suitable, comfortable and provides the right level of support. A 6 mph high-performance electric wheelchair designed for use outside is not necessarily suitable for all day use in a small flat. As powerchair users often spend more time in their powerchairs, the powerchair needs to be right for the environment it's going to be used in. There is no point having a big high performance powerchair if it's too big to use indoors, or a small compact powerchair if it is to be used primarily outdoors. The powerchair performance may be an important factor if it is to replace a car, or provide independence and allow extended journeys.

Different users will need different sorts of seat, leg rests and armrests as they provide the user with comfort and stability. A powered seat, tilt and recline back, or electric leg rests might also be an optional accessory.

If the user will be spending a lot of time in the powerchair, then a wheelchair cushion, especially a memory foam cushion will be a wise investment to ensure comfort and help to prevent pressure sores.

Powerchairs charge in the same way that mobility scooters do:

The battery charger will usually plug into the powerchair control unit whilst the batteries are attached. This means that the user doesn't have to worry about lifting or refitting batteries.

Most models of electric wheelchair have a range of additional extras available:

These can include different leg rests, armrests, oxygen tank holders, and in some cases a different seating system. Some powerchairs are available with elevating seats so that the user can reach items on a work surface, on a shelf, or in a cupboard, that are normally out of reach of powerchair users.

Another option for someone who uses a traditional style of wheelchair is to add a battery pack and motor to the wheelchair. This will then turn the wheelchair into an attendant controlled powerchair.

This is a good option if the attendant regularly pushes the wheelchair up hills, or wants to be able to be able to go up hills. The only downside to this option is that the user isn't independent and has to rely on someone to push them around. However, this can be a good compromise between a traditional wheelchair and a powerchair.A powerchair can help to maintain or bring back independence, as they are easy to operate and maintain, electric wheelchairs can make a significant difference to the quality of life.
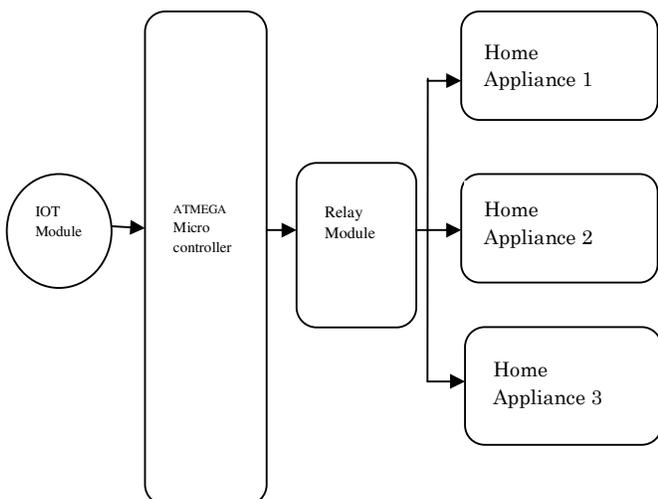
IV. BLOCK DIAGRAM:

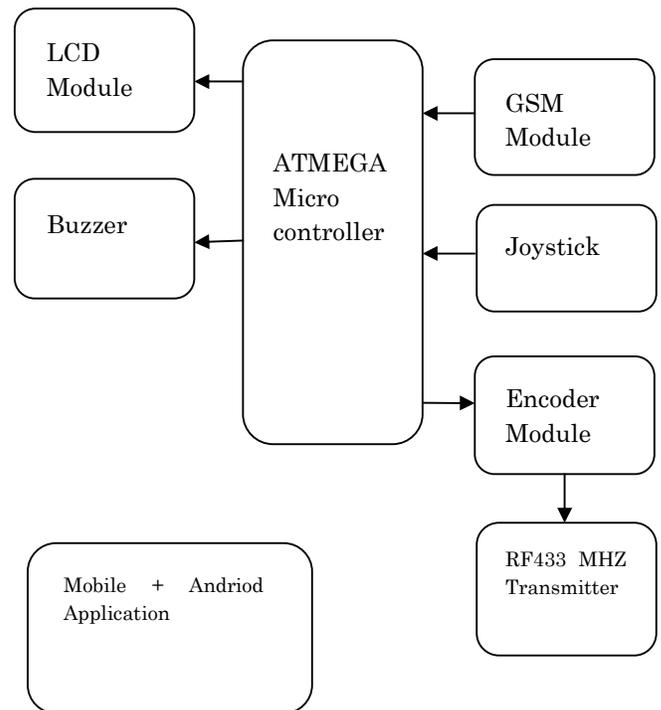**FIG a: ELECTRONICS FOR CONTROLLING HOME APPLIANCES.**

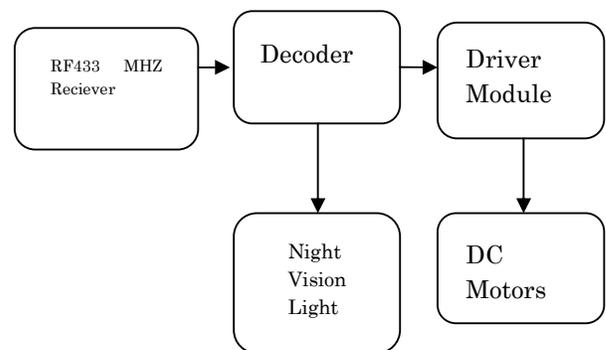**FIG b: ELECTRONICS FOR CONTROLLING WHEEL CHAIR.**

FIG c: ROBOT CHASSIS MOUNTED ELECTRONICS.

ATMEGA 328P Microcontroller:

The ATMEGA 328P is a single-chip microcontroller created by Atmelin the mega AVR family. It has a modified Harvard architecture 8-bit RISC processor core.

433MHz Receiver and Transmitter:

The 433MHz transceiver/receiver modules are used on a wide variety of applications that require wireless control.

Specifications RF 433MHz Receiver:

Frequency Range: 433.92 MHz, Modulation: ASK, Input Voltage:5V

Specifications RF 433MHz Transmitter: Frequency Range: 433.92MHz, Input Voltage: 3-12V.

GSM Module:

GSM is a mobile communication modem; it is stands for global system for mobile communication. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands.

Decoder and Encoder Module:
Decoder is a combinational logic circuit that converts binary information from the n coded inputs to a maximum of 2n unique outputs. They are used in a wide variety of applications, including data demultiplexing, seven segment displays, and memory address decoding. n **e**ncoder is a device, circuit, transducer, software program, algorithm or person that converts information from one format or code to another, for the purposes of standardization, speed or compression.

LED Board:
LED Display (light-emitting diode display) is a screen display technology that uses a panel of LEDs as the light source.

LCD Module:
Stands for "Liquid Crystal Display". LCD is a flat panel display technology commonly used in TVs and computer monitors. It is also used in screens for mobile devices, such as laptops, tablets, and smart phones.

Resistors:
A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses.

Capacitor:
A capacitor is a passive two-terminal electronic component that stores electrical energy in an electric field.

DC Motor:
A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields.

9V-12V Battery:
Batteries are a collection of one or more cells whose chemical reactions create a flow of electrons in a circuit. All batteries are made up of three basic components: an anode (the '-' side), a cathode (the '+' side), and some kind of electrolyte (a substance that chemically reacts with the anode and cathode).

Buzzer:
A buzzer or beeper is an audio signaling device which may be mechanical, electro-mechanical, or piezoelectric (*piezo* for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

Joystick:
A joystick is an input device consisting of a stick that pivots on a base and reports its angle or direction to the device it is controlling. A joystick, also known as the control column, is the principal control device in the cockpit of many civilian and military aircraft, either as a center stick or side-stick. It often has supplementary switches to control various aspects of the aircraft's flight.

V. CONCLUSION:
The outcome of this project is that the physically handicapped person can easily move with the help of joystick without depending on others. Physically handicapped person will be able to easily access their home appliances. They need not be dependent on others to operate the appliances. The handicapped person can easily alert the other person in case of emergency just by pressing the push button which is on the wheel chair. Also a SMS notification is sent to the other person that there is an emergency, so that he can reach to the handicapped person at the earliest. The system would be very useful for any physically disabled person, who is not able to walk. He would be able to control the home appliances like room light, Fan, AC etc from his wheelchair itself. The system can be modified to have voice control as well, which will enable handicapped person to control the appliance as well. He would be Easy Control of home appliances by physically disabled person

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