Design and Development of an Accident Detection Technique Based On the Incorporation of the Wifi Direct Technology

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Abstract:*Road accidents are undoubtedly the most frequent and, overall, the cause of the most damage. So, it is necessary to take correction measures within the prescribed time to save lives. In case of crowd areas, people will be able to help the victims. But in deserted areas, it is necessary to detect the victim once he/she is harmed. In previous detection methods, we need internet to connect the server and the client. An embedded system has been developed which observes an object, the system also sends a alert message to the authorized user through Wi-Fi direct technology such that remedy measures can be easily taken irrespective of internet connection. These features are embedded into an robot and is allowed to monitor the restricted/ deserted places.*

Keywords: *Wi-Fi Direct Technology*

I. INTRODUCTION

Technology has become the solution to many long standing problems and while current technologies may be effective, it is far from fully addressing the hug, complex, difficult and challenging tasks associated with disaster missions and risky intervention. The challenge is finding creative, reliable and applicable technical solutions in such highly constrained and uncertain environment.

Robotics can play important intelligent and technological roles that support first response equipment in harsh and dangerous environments while replacing rescue personnel from entering unreachable or unsafe places. Robotics solutions that are well adapted to local conditions of unstructured and unknown environment can greatly improve safety and security of personnel as well as work efficiency, productivity and flexibility. Solving and fulfilling the needs of such tasks presents challenges in robotic mechanical structure and mobility, sensors and sensor fusion, autonomous and semi-autonomous control, planning and navigation and machine intelligence.

This paper categorizes the source of disasters and highlights the needs for suitable and reliable technology and technical and functional requirements of robotic systems to fulfil task objectives. In addition, it shows that robotic technologies can be used for disasters prevention or early warning, intervention and recovery efforts during disasters with all possible kinds of relevant missions while ensuring quality of service and safety of human beings. Some of these missions may include: demining, search and rescue, surveillance, reconnaissance and risk assessment, evacuation assistance, intrusion/ victim detection. Along with this a new technology called Wi-Fi direct technology has been introduced which used for transmitting messages in the absence of internet.

II. THE FLYING ROBOT CONCEPT

Much thought has been put into development of robotic helpers for the infants and elderly. Advances in micro technology, microprocessors, sensor technology, smart

Fig 1: Image taken by robot

materials, signal processing and computing technologies, information and communication technologies, navigation technology and biological inspiration in learning and decision making capabilities have led to breakthrough in the invention of a new generation of robots called service robots. Service robot is a generic term covering all robots that are not intended for industrial use, i.e., perform services useful to the wellbeing of humans and other equipment

(maintenance, repair, cleaning etc.,) and are not intended for rationalizing production. It is clear that the development of a unique and universal robot that can operate under wide and different task and environmental conditions to meet requirements is not a simple task.

Robotics research requires the successful integration of a number of disparate technologies that need to have a focus to develop: flexible mechanics and modular structures, mobility and behaviour based control architecture, human support functionalities and interaction, homogeneous and heterogeneous sensors integration and data fusion, different aspect of fast autonomous or semi-autonomous navigation in a dynamic and unstructured environment, planning, coordination and cooperation among multi robots, wireless connectivity and natural communication with human, virtual reality and real time interaction to support the planning and logistics of robot service and machine intelligence, computation intelligence and advanced signal processing algorithms and techniques.

A. Aeril Robot Sytems for USAR(Urban Search And Rescue)

There is many different kind of catastrophe in natural and man-made disaster: earthquake, flooding, hurricane and they cause different disaster area like collapsed building, landslide or crater. During these emergency situations and specially in urban disaster, many disaster, many different people are deployed(policemen, fire fighters and medical assistance). They need to cooperate to save lives, protect structural infrastructure and evacuate victims to safety. In these situations, human rescuers must make quick decisions under stress, and try to get victims to safety often at their own risk. They must gather determine the location and status of victims and the stability of the structures as quickly as possible so that medics and firefighters can enter the disaster area and save victims.

All of these tasks are performed mostly by human and trained dogs, often in very dangerous and risky situations. This is why since some years, mobile robots have been proposed to help them and to perform tasks that neither human dogs nor existing tools can do. For this project, we will focus only on robots which will work in a disaster environment of man made structure, like collapsed buildings. They are called urban Search And Rescue(USAR) Robots.

B. Utilization of aerial robot systems

As utilizations of the aerial robot systems, you can think following USAR activities.

1. Information gathering: Information of the disaster-stricken area is collected in various media such as pictures, videos, sounds and other sensing data by using measuring equipment.
2. Information relay: Communication between two ground sites is relayed by the station in the air which is free from obstacles on the surface.

III. ROBOTIC INDICATION OF ACCIDENT AREA

In our experimental setup, we use six samples of different levels of car damages generally found. Initially, the robot is preloaded with sample images. The robot then runs a high pass filter through the images and replaces them with the original image. The high pass filter allows the robot to identify the damage done to the car more specifically. Then the robot is triggered towards the car by sensing DTMF signals sent to it. A person with a mobile phone can locate the nearest robot by switching the Wi-Fi direct technology and pairing with the nearest robot. Then, the robot can be made to travel towards the damaged car. Now, the robot moves slowly around the car, taking pictures at regular intervals. It runs a high pass filter through the captured images and the preloaded images. The nearest matching image depicts the level of the damage. The robot can then decides the necessary actions to be taken based on the algorithm. Computer vision system for the aerial is under development to perform object recognition and navigation. We are also exploring the possibilities in combining control with vision directly for visual serving and path planning. For control, in order to obtain information about position, orientation, velocities and accelerations in both angular and translational directions, a Kalman filter will be employed for sensor fusion with the outputs, velocities and accelerations in both angular and translational directions, a Kalman filter will be employed for sensor fusion with the outputs of inertial sensors and GPS.

A. Micro Controller

The MSP230 is a mixed- signal microcontroller family from Texas Instruments. Built around a 16-bit CPU, the MSP430 is designed for low cost and specifically, low power consumption embedded applications. The electric current drawn in idle mode mode can be less than 1µA. The top CPU speed is 25MHz. It can be throttled back for lower power consumption. The MSP430 also uses six different low-power modes, which can disable unneeded clocks and CPU. Additionally, the MSP430 is capable of wake-up times below 1µs, allowing the microcontroller to stay in sleep mode longer, minimizing its average current consumption.

The device comes in a variety of configurations featuring the usual peripherals: internal oscillator, timer including PWM, watchdog, USART, SPI, I^2C, 10/12/14/16/24-BIT ADCs and brownout reset circuitry. Some less usual peripheral options include comparators(that can be used with the timers to do simple ADC), on-chip op-amps for signal conditioning, 12-bit DAC, LCD driver, hardware multiplier, USB and DMA for ADC results. Apart from some older EPROM(MSP430E3xx) and high volume mask ROM(MSP430Cxxx) versions, all of the devices are in-system programmable via JTAG (full four-wire or Spy-Bi-Wire) or a built in bootstrap loader(BSL) using UART such as RS232 or USB on devices with USB support.

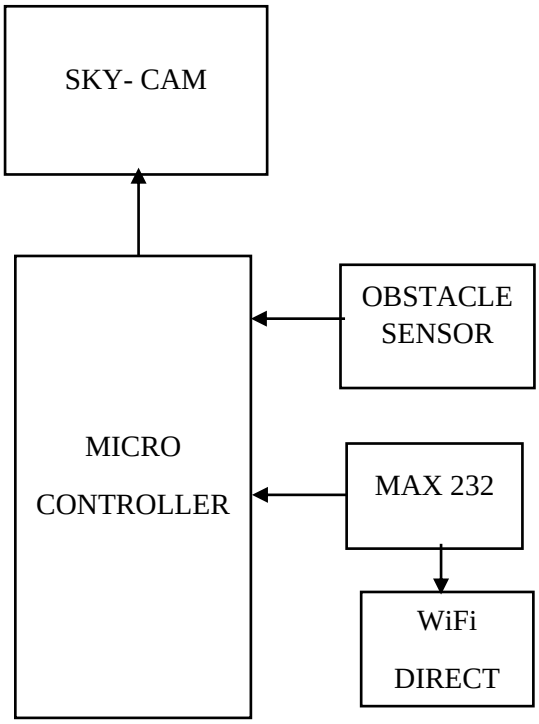

Fig 2: Block diagram

B. MAX 232

The MAX232 is an IC, first created in 1987 by Maxim Integrated Products, that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals.

The drivers provide RS-232 voltage level outputs(approx., ±7.5V) from a single +5V supply via on-chip charge pumps and external capacitors. This make it useful for implementing RS-232 in devices that otherwise do not need any voltages outside the 0V to +5V range, as power supply design does not need to be made more complicated just for driving the RS-232 in this case.

The receivers reduce RS-232 inputs(which may be as high as ±25V), to standard 5V TTL levels. These receivers have a typical threshold of 13V, and a typical hysteresis of 0.5V.

C. Obstacle Sensor

In robotics, obstacle avoidance is the task of satisfying some control objective subject to non-intersection or non –collision position constraints. In unmanned air vehicles, it is a hot topic. What is critical about obstacle avoidance concept in this area is the growing need of usage of unmanned aerial vehicles in urban areas for especially military applications where it can be very useful in city wars. Normally obstacle avoidance is considered to be distinct from path planning in that one is usually implemented as a reactive control law while the other involves the pre-computation of an obstacle – free path which a controller will then guide a robot along.

D. Camera

Sky-cam is a computer-controlled stabilized, cable-suspended camera system. The system is maneuvered through three dimensions in the open space over a playing area of a stadium or arena by computer-controlled cable-drive system. It is responsible for bringing video game-like camera angles to television sports coverage. The camera package weighs less than 14kg(30.861bs) and can travel at 13m/s(29.08 mph).

E. WiFiDirect

WiFi direct, initially called WiFi P2P, is a WiFi standard enabling devices to easily connect with each other without requiring a Wireless Access Point. It is useful for everything from the internet browsing to file transfer and to communicate with one or more devices simultaneously at typical WiFi speeds. One advantage of Wifi Direct is the ability to connect devices even if they are from different manufacturers. Only one of the Wi-Fi devices needs to be complaint with Wi-Fi Direct to establish a peer-to-peer connection that transfers data directly between them with greatly reduced setup.

The pairing of Wi-Fi Direct devices can be set up to require the proximity of a near field communication, a Bluetooth signal, or a button press on one or all the devices. Wi-Fi Direct essentially embeds a software access(soft AP) point

provides a VERSION OF Wi-Fi Protected Setup with its push-button or PIN-based setup.

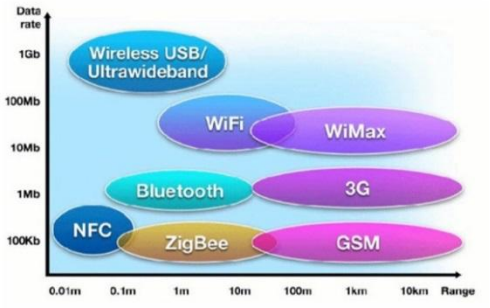

Fig 3: Comparison of WiFi technologies

When a device enters the range of the Wi-Fi Direct host, it can connect to it and then gather setup information using a Protected Setup-style transfer. Connection and setup is so simplified that it may replace Bluetooth in some situations.

Indian internet company Hike Messenger today announced the introduction of Hike Direct that allows users to chat, exchange stickers, transfer photos and heavy files of any type, without the internet or incurring data charges.

According to a statement the company claimed that Hike Direct allows mobile devices to connect with one another directly within a 100 meter radius completely by passing the telecom networks. Once connected, users can chat and shar files like they would using any other messaging app. In fact, these transfers can happen directly with a speed of up to 40Mbps.

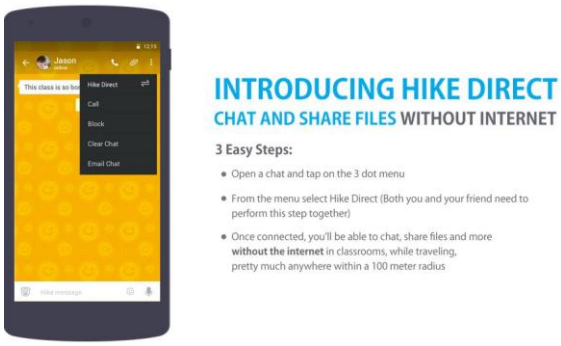

Fig 4: Hike Direct

We can employ this technology for the communication between the client and server upto 100m distance. Since this technology is independent of internet connection messages can be sent to the authorized user without any delay.

IV. CONCLUSION

The experiences have identified critical technical issues and capabilities of current robots that should be researched and improved. Some of these issues are flexible locomotion system and mobility, intelligent and modularized mechanisms, wireless communication, different sensing capability and techniques for data fusion, learning and decision making capabilities, coordination and cooperation among members of multi robotic system, task allocation, power consumption and charging and human machine interaction danger detection and timely decision, etc., These are many engineering, technical and scientific challenges in the application domains of robotics for disaster missions and risky intervention.

The Wi-Fi direct technology provides only upto 10m distance and so, it consumes time to reach the authorized user. Measures has to be taken in order to rectify this particular issue.

V. ACKNOWLEDGEMENT

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