Cell Phone Tracking Camera Controller

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Abstract

A mobile phone or mobile is an electronic device used for mobile telecommunications, but nowadays there is a need for a new definition. Even though the use of cell phones is vital these days, there are still many places where it is restricted. And so we present the "Cell Phone Tracking Camera Controller" which aids in detection of the use of mobile phones in restricted areas. This smart camera controller can detect the presence of a mobile which is receiving or transmitting data. As soon as a phone which is in use is detected, the camera controller changes the camera scope and directly records the movement of the mobile phone user. This mobile transmission detector or 'sniffer' can sense the presence of an activated mobile cell phone in the range of five to seven meters and thus be used to prevent use of mobile phones in examination halls, confidential rooms, etc. It is also useful for detecting the use of mobile phone for spying. The "Mobile Tracking Camera Controller" is an extremely economical solution which can be expanded by a small additional cost to employ more cameras and mobile transmission detectors.

1. Introduction

One can easily say that this world is living on mobile phones. It's a great revolution in electronic world. In every area whether it is industrial or domestic field, mobile phones are playing an important role. Just like every technology has its pros and cons, the mobile phone that was a breakthrough invention in the world of electronics has brought its own disadvantages too.

Consider the example of students. Their inordinate obsession of the use of mobile phones nowadays has prompted schools to set restrictions on the use of mobile phones because of their unethical use - cheating in tests, harassing other people, causing security threat, and facilitating gossip and other social activity in school.

This camera controller coupled with a mobile transmission detector divides an area (room for instance) into various zones. Instead of the conventional method of monitoring these zones simultaneously, one can simply narrow down the surveillance range to a zone which is most prone (as found from the mobile phone detector). The camera controller will automatically move the camera scope to the prone areas to facilitate ease of monitoring.

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2. Description

2.1. Mobile Transmission Detector

This is a low cost device which picks up the electromagnetic waves within a zone. The current signal is amplified and converted into voltage signal, which can be detected by the

microcontroller 89C51. This circuit uses IC CA3130 and IC 555.

2.2. Camera Controller

This comprises of Darlington Transistor Array (ULN2003) acting as a stepper motor driver and a stepper motor attached to the camera module. The stepper motor driver consists of seven NPN Darlington pairs that feature high-voltage outputs with common-cathode clamp diode for switching inductive loads. This block is connected as an output device to the controller. The input from a particular mobile transmission detector sends corresponding pulse to the stepper motor driver to reposition motor shaft such that the detected zone comes under the camera's scope [2] [3].

3. Block diagram of cell phone tracking camera controller

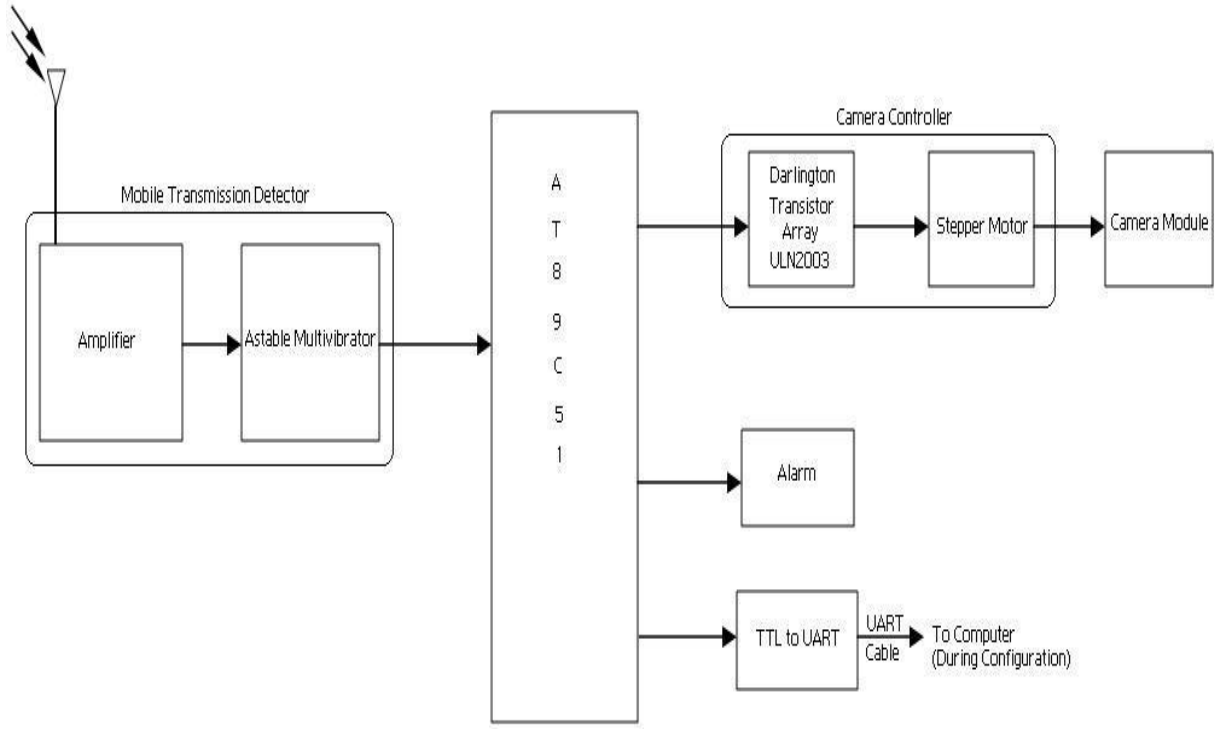

Fig.1 Block Diagram

4. Working

4.1. Mobile Transmission Detector

The circuit is intended to detect unauthorized use of mobile phones. An ordinary RF detector using tuned LC circuits is not suitable for detecting signals in the GHz frequency band used in mobile phones. The transmission frequency of mobile phones ranges from 0.9 to 3 GHz with a wavelength of 3.3 to 10 cm [4] [5]. So a circuit detecting gigahertz signals is required for a mobile transmission detector [6]. Multiple "Mobile Transmission Detectors" may be installed to accommodate larger areas.

To detect the signal, the capacitors are arranged as a mini loop aerial. To make the loop aerial leads of the capacitor should be long enough [4]. A capacitor is connected between the inverting and non-inverting inputs of Op-amp IC CA3130. One lead of capacitor gets DC from the positive input of IC1 so the capacitor gets energy for storage. These energies applied to the input are almost balanced with 1.4V. In this state output is zero.

The IC CA3130 is used to provide very high input impedance, very low input current and very high speed of performance. When the mobile phone radiates high energy pulsations the capacitor oscillates and releases energy to the input of Op-Amp and transfers the stored energy in the form of minute current to the input of IC CA3130. This will upset the balance input of Op-Amp and convert the current to corresponding output voltage [5]. This oscillation is indicated by the flashing of LED. When mobile phone signals are detected by capacitor [6] [7], the output of IC CA3130 becomes high and low alternately according to the frequency of signal as indicated by LED. This triggers IC 555. This IC operates in astable mode of operation. Hence once a mobile is detected a stable pulse of 5 V of 3 seconds duration is applied to the input of the microcontroller 89C51.

4.2. Camera Controller

A predefined look-up table of input versus position is created by using the configuration software as explained later. Depending upon which port of microcontroller 89C51 receives the input, the stepper motor driver will be fed by a particular binary output from the controller (according to the look-up table) [1]. This would rotate the stepper motor, which is connected to the output of stepper motor driver, to a position indicated by the look-up table. This will cause the camera to rotate and any suspicious activity pertaining to the usage of cell phone, in the detected zone would be displayed [1] [2].

In a situation when more than one active cell phone is detected from more than one zone then a priority resolver function created in the software comes to our rescue. According to the priority resolver, the camera would switch between every active zone in an interval of 10 seconds.

4.3. Configuration Software

The configuration software is nothing but a GUI designed in MATLAB, which is used to create the lookup table in the memory of the microcontroller 89C51 during the time of installation. It provides features to add zones to a room and move the camera according the user so as to save the position of a camera with respect to a selected zone.

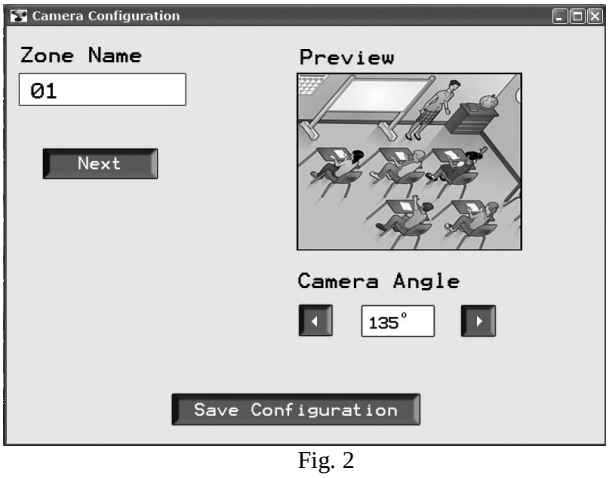

Fig. 2

This is illustrated in figure (2). Here the user has selected "ZONE 1" for configuration. He can then move the stepper motor shaft by the left and right arrow keys (increments/decrements by 45 degrees). [3] Once a particular position is fixed, he can save it by clicking on the SAVE button. This will transmit data via the UART cable attached to the controller and would add this data to the array created within the microcontroller. As more zones are added this dynamic array grows to accommodate their names and position. Finally after all zones are included a complete lookup table is created and the configuration process is complete. Now whenever any particular zone detects a cell phone in use, the position as saved by the user will be fed to the stepper motor and its shaft would rotate so as to display the saved position. Any time after installation the user can add more "mobile transmission detectors" and configure them in the way as explained above.

Figure (3) shows an implemented model of Cell Phone Tracking Camera Controller in an examination hall. It clearly shows ZONE 2 getting activated by an active mobile phone, and how the camera repositions itself in order to point at the students in that area (as saved during configuration).

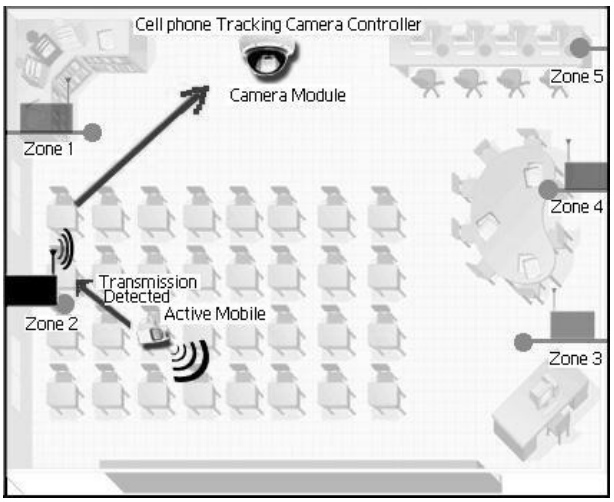

Fig. 3

5. Conclusion

Multiple cameras can be installed along with multiple mobile detectors and thus increasing the scope to capture the entire room area.

With a single camera 25 zones can be installed. In order to increase the number beyond the above, one can simply connect a multiplexer.

The priority resolver function can be made flexible enough such that the user can vary the time of camera switching between various active zones.

The mobile detector which is readily available works in the frequency range of 0.9 to 3GHz. This will limit the detection of certain mobile phones as they work on lower band frequencies. Detectors with such wide range frequency band can also be used.

In order to reduce the number of zones, smart detectors with rotating antenna can be used.

6. References

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