FUTURISTIC SOLAR CELLS POWERED SMART AUTONOMOUS LOW COST SURVEILLANCE ROBOT

***S.Karthik, **M. J. Roashaael Joaraj, **R. Praveen, **R. Siva Sakthi Ram**

**Dept of Electrical & Electronics Engineering, Panimalar Engineering College, Chennai*
***Dept of Electrical & Electronics Engineering, Valliammai Engineering College, Chennai*

ABSTRACT

Wireless Technology plays a vital role in control of robot, but this has a main disadvantage of range over certain distance only. Many research and development activities are carrying out by various researchers in this wireless communication. This project has a efficient design over infinite range of control based on satellite communication. In this project robot communicate through satellite and respective operation is performed. Solar cells are one of the more creative methods for the generation of renewable power. But in some cases, its applications are limited by space and the availability of sunlight. As a way of compensating for both, a new material in the form of graphene, along with perovskite is introduced into the process of preparation of solar modules, which improves the versatility and as a result, the uses and efficiency of solar cells.

Keywords- DTMF, graphene, solar cells, robot, wonder material, Wi-Fi camera, chopper, l293d

INTRODUCTION

The mobile robot control technology is widely spread all over the world in recent days. Since the mobile communication has infinite range, it can be used instead of short range devices like xbee, infrared etc. many research are being carried out now a days in order to have a surveillance robot which can be controlled from anywhere on the earth using basic model mobile phones. This paper suggests a method to control a robot using a mobile phone, irrespective of the phone model and mobile phone carrier.in this system , the mobile phone is registered in such a manner that, a call from a particular number is only accessible and the phone is programmed with auto answer feature. Existing methods for robot control using mobile phones have usage problems because the cost and need for continuous control. The method of robot control suggested in this paper can solve the problems of existing methods control that use simple voice calls. This model is cost wise efficient. Using the DTMF (Dual Tone Multiple Frequency) the movement of the robot can be controlled. This DTMF signals are generated when a keypad button of the mobile phone being called by the robot is pressed. A mobile phone user controls the robot by sending the DTMF tone to the robot.
The DLINK 932l is a wireless camera which is used in this project for live video streaming. This dlink camera also uses cloud communication which is done over satellite.

This method also proposes a new wonder material GRAPHENE, which can be used in solar panels for maximum efficiency. . They are also light, flexible, and potentially transparent, which provides the opportunity for a broader range of applications including see-though solar windows.

DTMF DECODING USING 8870

The Dual Tone Multiple Frequency (DTMF) signal consists of two sinusoids or tone with frequencies taken from two mutually exclusive groups. These frequencies were chosen to prevent any harmonics from being incorrectly detected by the receiver as some other DTMF frequency. Each pair of tones consists of one frequency of the low frequency group (697 Hz, 770 Hz, 852 Hz, and 941 Hz) and one frequency of the high group (1209 Hz, 1336 Hz, and 1477Hz) and represents a unique symbol. The multiple tones are the reason for calling the system multi- frequency.

The table 1 shows the frequency allocation for every key in keypad

Button	Low DTMF frequency (Hz)	High DTMF frequency (Hz)	Binary coded output			
			Q1	Q2	Q3	Q4
1	697	1209	0	0	0	1
2	697	1336	0	0	1	0
3	697	1477	0	0	1	1
4	770	1209	0	1	0	0
5	770	1336	0	1	0	1
6	770	1477	0	1	1	0
7	852	1209	0	1	1	1
8	852	1336	1	0	0	0
9	852	1477	1	0	0	1
0	941	1336	1	0	1	0
*	941	1209	1	0	1	1
#	941	1477	1	1	0	0

Its time domain graph is shown in fig 1.

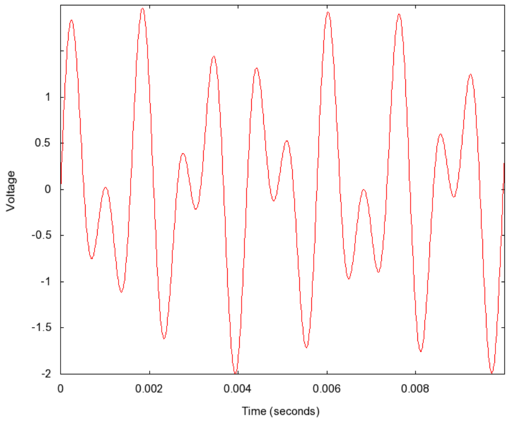


Fig1. Time domain graph for key "1"

Similarly the various time domain graphs is shown in fig 2.

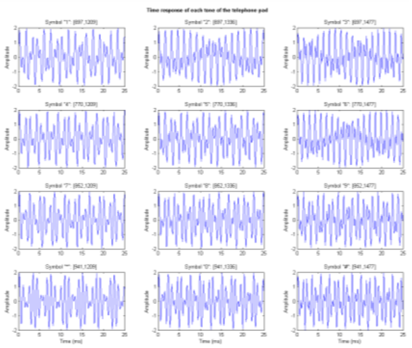


Fig2. Time domain graph for keys "0-9"

This DTMF decoder produces binary outputs. These outputs are fed into motor driver L293D for driving the wheels of the robot.

IMPLEMENTATION

The output binary codes from the dual tone multiple frequency circuit is fed into the input pins of L293D integrated chip. L293D consists of 4 outputs which is given to the four motors of the robot. The robot consists of DLINK wireless camera which is used for live video streaming. This dlink camera works on the principle of cloud communication. Even cloud computation is satellite based communication, which have infinite range too. The live video can be viewed in any devices like desktops, laptops and mobile applications. The dlink camera must be connected to the wireless network. This camera serves best for monitoring purpose. Fig3 shows the working principle of DLINK camera.

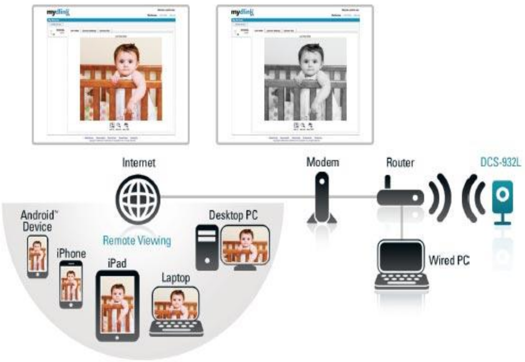
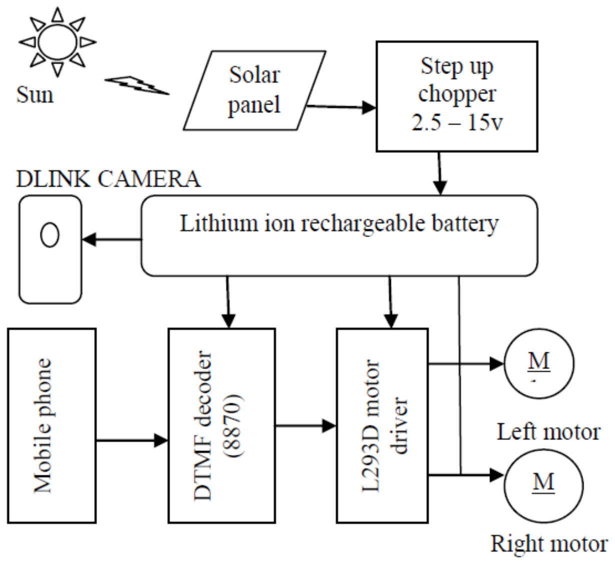


Fig3. Working of DLINK wireless camera

Fig4. Complete setup of the robot

This setup can be used in places where human reach Is negligible. For example, a bank in AMERICA can be monitored from INDIA and the live video can be seen in AUSTRALIA. This is the main advantage of this proposed model. Other communication modules like XBEE, infrared, Bluetooth have shorter range of communication, while this satellite communication is very wide and low cost. Since universal frequencies are used, cost is low and also compatible with all mobile phones. The project involves no use of any microcontroller. The audio frequencies from phone can be transmitted to the decoder chip via 3.5mm universal audio jack. Fig4 shows the complete setup of the robot. The total working operation can be explained with a block diagram.

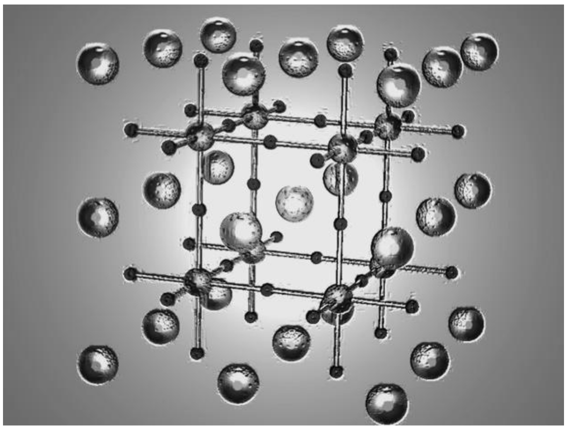


SOLAR CELLS COMBINED WITH THE DEVICE

Solar cells are typically named after the semiconducting material they are made of. These materials must have certain characteristics in order to absorb sunlight. The first generation cells—also called conventional, traditional or wafer-based cells—are made of crystalline silicon, the commercially predominant PV technology, that includes materials such as polysilicon and monocrystalline silicon. Second generation cells are thin film solar cells, that include amorphous silicon, CdTe and CIGS cells and are commercially significant in utility-scale photovoltaic power stations, building integrated photovoltaics or in small stand-alone power system. The third generation of solar cells includes a number of thin-film technologies often described as emerging photovoltaics—most of them have not yet been commercially applied and are still in the research or development phase. Many use organic materials, oftenorganometallic compounds as well as inorganic substances. Despite the fact that their efficiencies had been low and the stability of the absorber material was often too short for commercial applications, there is a lot of research invested into these technologies as they promise to achieve the goal of producing low-cost, high-efficient solar cells.

Perovskites could resolve this by matching the output of silicon cells at a lower price than that of thin-film CIGS: Their ingredients are cheap bulk chemicals, and the cells can be built using simple, low-cost processing techniques.The materials absorb different wavelengths of light, and perovskites generate a higher voltage than silicon, so using them in tandem would boost the power output of conventional cells.When it comes to graphene and photovoltaics, for the most part it's only been a story about replacing the indium tin oxide (ITO) used as the transparent electrodes of organic solar cells.

The mineral perovskite is enjoying a period of rapid improvements for its use in solar cells where its particular crystal structure offers an inexpensive solution for creating photovoltaics with high charge-carrier mobility and long diffusion lengths. These properties make it possible for the photo-generated electrons and holes to travel long distances without energy loss. In real world terms this means that the electrons in perovskite-based photovoltaics can travel through thicker solar cells, which absorbs more light and thereby generates more electricity than thinner cells.

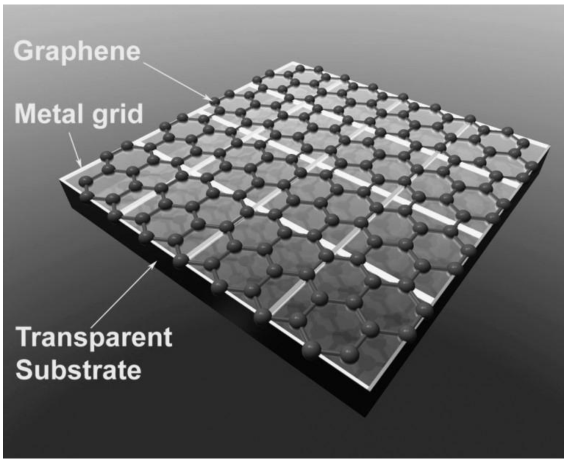


Structue of perovskite

Scientists made this breakthrough in part by removing silicon from the equation. The experimental solar cell uses a combination of titanium oxide and graphene as a charge collector and perovskite to absorb sunlight. Past cells have relied on silicon wafers coated with graphene.

However a new method is being used in which is being used in which graphene and TiO_2 combine to serve as charge collectors while perovskite acts as the sunlight absorber. Graphene films have high transparency in the visible and near-infrared regions and are chemically and thermally stable. The team started with a baseline organic solar cell and calculated that if you keep the layers of graphene down to four, you can get 92.3 percent of the power delivered by an equivalent ITO electrode. The solution was a kind of mathematical balancing act. You can bring down the resistance of graphene simply by layering on more sheets, but the downside is that you block more light.

Graphene has a unique combination of high electrical conductivity and optical transparency, which make it a candidate for use in solar cells. A single sheet of graphene is a zero-bandgap semiconductor whose charge carriers are delocalized over large areas, implying that carrier scattering does not occur. Because this material only absorbs 2.3% of visible light, it is a candidate for applications requiring a transparent conductor. Graphene can be assembled into a film electrode with low roughness. However, graphene films produced via solution processing contain lattice defects and grain boundaries that act as recombination centers and decrease the material's electrical conductivity. Thus, these films must be made thicker than one atomic layer to obtain useful sheet resistances. This added resistance can be combatted by incorporating conductive filler materials, such as a silica matrix.



Graphene Solar Cell

Silicon generates only one current-driving electron for each photon it absorbs, while graphene can produce multiple electrons. Solar cells made with graphene could offer 60% conversion efficiency – double the widely-accepted maximum efficiency of silicon cell.

They have also highlighted the importance of this study for the field of photovoltaic energy because they have obtained a high degree of efficiency. Besides, the device is manufactured at low temperatures, thus facilitating its large-scale manufacturing in industry. In turn, this fact means lower production costs and the possibility of using it in devices based on flexible plastics.

Previous perovskite cells needed a 500-degrees C sintering process to build the electron collection layer. So that pretty much rules out making solar cells on inexpensive polymer substrates as well as creating multi-junction device architectures.

But the graphene and the titanium dioxide electron collection layers can be produced at temperatures that never rise above 150 degrees C.

The researchers also report that not only can they produce the perovskite solar cells in a low-cost process but also that the energy conversion efficiency reached 15.6 percent, just slightly above the 15 percent achieved by the highestper-forming perovskite cells manufactured with the sintering process. The conversion efficiency also surpasses levels reached when silicon and graphene are combined.

Hence, future designs can incorporate this type of solar cells in this automation technique to add versatility

CONCLUSION

The paper presented the implementation of low cost surveillance robot which uses satellite communications like gsm and cloud in order to have a wide range .this robot is powered by futuristic solar cells and energy harvesting devices . by using mobile calls from a particular area, a user can have live video of the things that is happening anywhere.

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