

ACCIOUR: An Accident Detection and Life Saviour System using IoT



Supritha S Rao, Srinivasachar G

Abstract: *At the end of the day, being alive becomes the topmost priority for anyone in their life span. We can usually see more road tragedies than any good things happening around us. There are many people who lose their precious lives after accidents due to no proper ambulance facility, no one to communicate about the accident to the hospitals or majorly due to getting stuck in the traffic of big cities. The ACCIOUR-IoT based system helps to overcome these problems. Initially, each vehicle will have a device which activates soon after an accident takes place and sends the location to the close ones and to the main server that holds the information of various nearby ambulances, and hence forwards the location to the ambulance. Ambulance on getting the information can turn on their devices that help the traffic signals along their route to know there's emergency and hence to clear the traffic as much as possible by turning on their green lights immediately so that the patient is taken from the accident spot and later admitted to hospital within the short duration that is possible. On the way, the ambulance will take a quick check on the patient and send information regarding their present condition even before they reach the hospital so that the hospital doctors are aware of what kind of treatment that has to be provided to the patient who is on the way to their hospital. This system majorly challenges the methodology that is currently adopted and provides a better solution to overcome their limitations. Overall, ACCIOUR system is all about saving a precious life and the lives of many others who are indirectly connected to them through technology. spacing. Author Profile must be in Font Size 8, with single line spacing. Fore more details, please download TEMPLATE HELP FILE from the website.*

Keywords: *IoT, Accident-detection, Life saviour, GPS Module, GSM Module, RFID.*

I. INTRODUCTION

In recent times we can see that the production of automobiles are increasing day to day, and so are the numbers of tragic vehicular accidents on the roads all over the world. Many reasons to this include rash driving, lack of concentration, drink and drive, no complete knowledge about the traffic rules and their regulations, and also due to drowsiness seen amongst the drivers on the road. Even after

the deadly accidents are caused there are very few ways that eventually lead to save the lives of injured people. Many die due to not getting the required treatment or also due to non-availability of ambulance. There are many scenarios which also tell us that even after the ambulance reaches and takes wounded people into the ambulance, it has resulted in loss of life due to heavy traffic that makes the ambulance get stuck in between thousands of vehicles which result in not reaching the hospital in time, and hence a life is lost.

Taking into account of all that is happening currently in the world, the ACCIOUR system acts as a life savior system after the accidents by providing help to the wounded and injured people right from detecting the accidents to helping them reach the hospital within time. The name ACCIOUR is combined of two words, accident and savior which conveys the message that it is a smart system that help in saving the people's life as a savior would after an accident.

This system uses Internet of Things, or IoT which has proven to be very economic and really helpful over many industries to make automated devices, and which also has less human interference and more of an intelligent way to look at things and in the way they work in the most efficient and time-saving ways. With the large amount of different sensors and their functionalities that this technology provides, is made use of in the ACCIOUR system. There are sensors that detect the accidents and the intensity of the accidents, and hence, can be incorporated within all the vehicles so that once the accidents are detected the particular location of the accident can be sent to the family members and to check in for the ambulance using the GPS and the GSM Modules. Once the location gets read in the main server the ambulance is found and sent to the particular location. Again with the use of RFID sensors the traffic signals that fall under the route can be communicated about the emergency and later to go green when the ambulance is nearing the particular traffic signal which will definitely help clear the traffic around the ambulance and help the injured get to the hospital at the earliest. Also, within the ambulance the Acciour system provides a monitoring device made of all the IOT based sensors that help in knowing the right condition of the patient, and also report the same to the hospital before the patient arrives in and have a basic knowledge about what the condition of the patient is and various other details that the doctors can use to provide a fast track treatment and reduce the time in inspecting the patients after they get into the hospital.

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In this way, the ACCIOUR system helps in providing a better platform for saving people's life after a dreadful accident. Because at the end of the day all that actually matters is one being alive and breathing in the air around. The outline of the entire ACCIOUR system is as shown in Fig. 1 below.

after having wounded people inside. All these leads to a stronger view that the prevailing system is quite not capable of saving people's life after accident. There is more probability of losing a precious life on the roads even before they can be

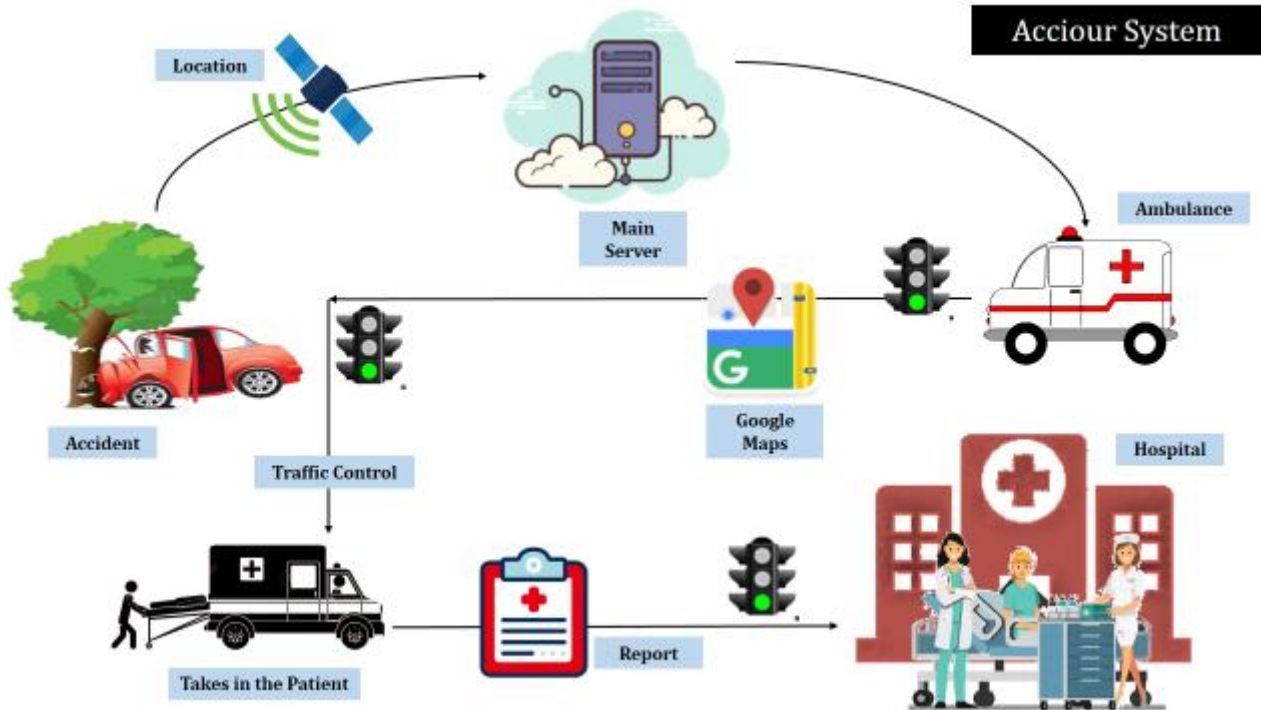


Fig. 1. Outline of ACCIOUR System

II. PREVAILING SYSTEM

As the number of production of automobiles are increasing day by day, so are the number of accidents as stated in [2]. Currently, we have a very vague system prevailing when an accident occurs. Usually when an unfortunate accident occurs there are many people that surround the area but none of them come to rescue the injured because they fear it would drag them into many procedures and hence avoid such situations. Since, time has changed and many regulations have been implemented which specifies that the one who helps the injured under any circumstances won't be pulled for further inquiries and due to this one out of many people who surround the accident area takes the courage to call the ambulance and do other required procedures. Later, the ambulance is called to the location, but it still won't be cent percent sure that the ambulance will reach on time. This is due to the large amount of traffic that prevails in the big cities. Assuming that the ambulance reaches on time and picks up injured people, and then admits the wounded in the hospital in time. Even then we see the doctors consume the first few vital minutes on examining the patient for their basic conditions like their heart rate, temperature and so on.

Overall this old prevailing system doesn't ensure completely that life is saved when an accident occurs. There are many loop holes like people not giving a call to the ambulance or the ambulance gets stuck on the way even before taking injured people in or might get stuck up later

properly aided and treated. Hence, it makes this system not reliable and the need for another system where things are automated and involves less interference of human.

Fig -2 depicts a flow of events that usually takes place after an accident occurs under the prevailing or the existing system as mentioned above.

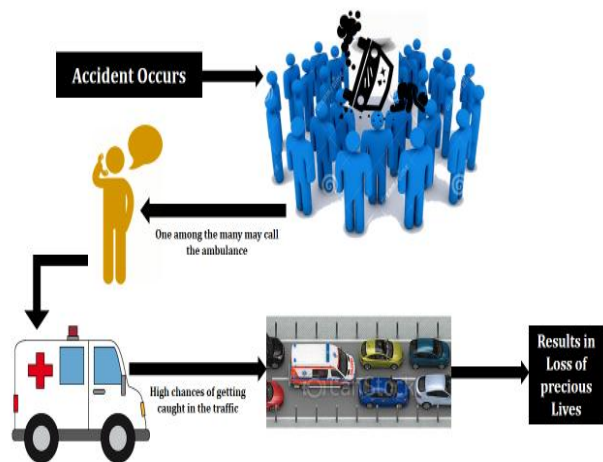


Fig. 2. The Prevailing System

III. PROPOSED SYSTEM

The proposed ACCIOUR system is divided into 5 different parts as mentioned below.

1. The first part includes checking of the occurrence of the accident and determining if it is a severe one or not a much severe one.
2. Second part involves a device that is implemented within each vehicle.
3. Third part consists of the RFID technology used in for the control of traffic.
4. Fourth part involves the healthcare and monitoring device within the ambulance.
5. Finally, the fifth part includes the report of the wounded person to the hospital even before the patient reaches the hospital.

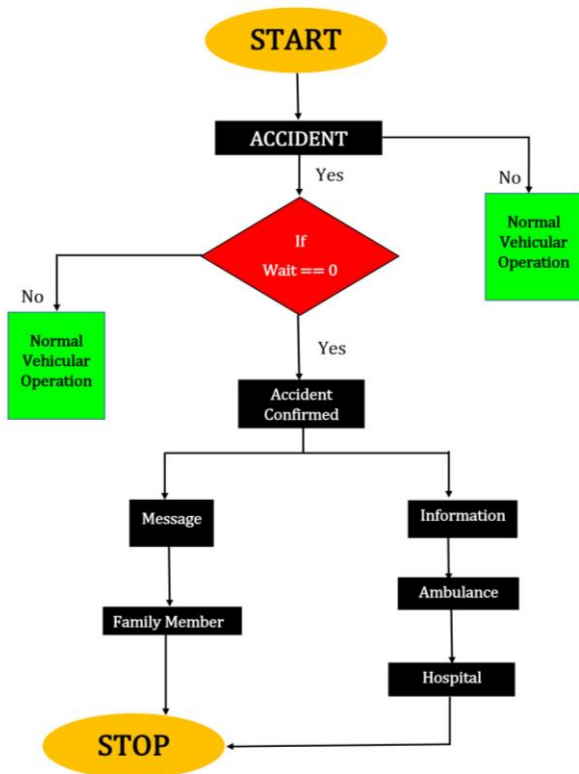


Fig. 3. Flowchart for detecting if the accident occurred

The first part of this proposed system is as shown in the flowchart above, Fig -3.

This is a very vital step to stop the entire system from working when it's not a major accident and the driver along with the passengers are not hurt severely. In this system, we give an opportunity to the driver to disable the entire working of the ACCIOUR system within 90 seconds. A timer is put up within the vehicle which count downs the time. If the accident is not that severe the driver would be able to respond quickly and switch off the Acciour system's on/off button and hence stopping the location being sent to the main server for further procedures. When the countdown reaches 0 or when the wait is equal to zero it leads to non-breakage of the system, and as a next step, it would send the location to the main server.

The second part of the ACCIOUR system is the implementation within the vehicle to detect the accident and send the location to both the main server and the family

members. An Arduino board is used for connecting various sensors. A battery and an IC regulator is connected to it in order to produce constant output even when there are differing inputs given from the battery. These two account in as the power supply of the entire model within the vehicle. A switch on/off button is provided to give a chance to the driver to break in the entire circuit of the ACCIOUR system. In order to detect that the accident has taken place we use the accelerometer and the tilt module sensors. The former is used to sense the vibrations which goes high as soon as the accident occurs and the latter is used to again detect the accident by the position of the vehicle. If the position is not particularly horizontal or has tilted due to the entire vehicle been upside down after the accident. Further a GSM module is used to connect it to the emergency number usually a family member's number that is stored in to pass on the message of the accident through SMS. GPS module is also used to connect it to the main server, so that it sends in the latitude and longitude of the location and henceforth, the ambulance can be sent to the right location.

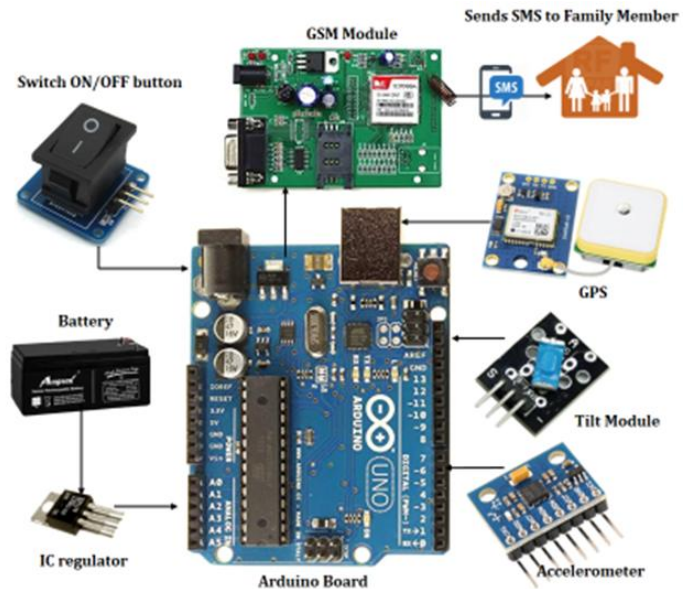


Fig. 4. Implementation within the vehicle

The third part comes to the picture after the GPS module sends the location to the main server and the main server reciprocates by finding in an ambulance, and passing on the accident location. While the ambulance is all set to rescue the patient there is always a hindrance from the traffic. In order to not get stuck in traffic an RFID technology is used. In this system, a series of RFID readers are planted along the way and the traffic signals. The ambulance would have an RFID tag within it. As the ambulance reaches any of the RFID reader which would be approximately a kilometer and a half away from the main traffic signal, would alert that an ambulance is almost approaching.

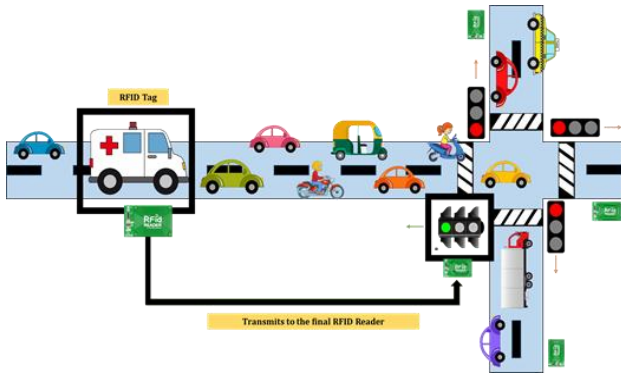
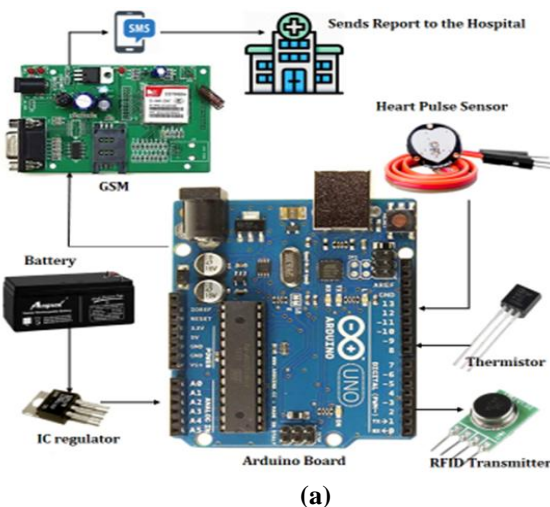


Fig. 5. RFID Technology

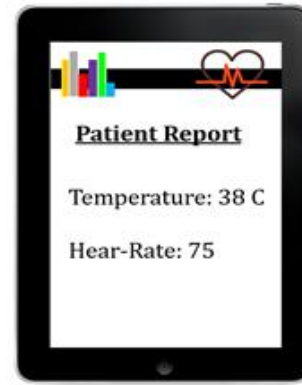
Under such circumstances, the reader present at the traffic signal will play its role of informing that there's an emergency and turn the red signal to green. The simple working of this part is shown in Fig -5.

The fourth part comprises the healthcare and monitoring device. Which has a heartbeat sensor that is also called as the pulse sensor. It is majorly used to find the pulse rate. It has to be attached onto the patient's body to get their beats per second. Usually when a person in anxious or is in sudden shock their heart rates increase exponentially. Hence, these can be used as a major patient's condition to treat them further. A thermistor is used to find the body temperature of the person. Higher temperature of the body has to be treated with a different methodology and hence it has to be informed to the doctors in the hospital. Further a battery and an IC regulator is also connected which provides power supply to this system. Arduino UNO is used to connect all these components as shown in the Fig -6a which together make the healthcare and monitoring system that is placed within the ambulance. It also has a GSM Module connected that sends the report of the findings of the patient's condition to the hospital even before the patient arrives to the hospital.

This is the fifth part of the ACCIOUR system, where in from the ambulance and through the GSM modules health report as shown in Fig-6b is sent to the hospital so that they start planning out about the most appropriate ways to treat the patient.



(a)



(b)

Fig. 6. Ambulance consists of (a) Implementation within the ambulance, (b) Patient's report that is sent from the ambulance to the hospital

These five parts together complete an ACCIOUR system and helps to reach its ultimate motive of helping injured people after an accident to survive and not lose their precious lives due to the present prevailing system.

IV. RESULT

ACCIOUR system is majorly developed in order to overcome the many limitations seen within the system that is currently been used or followed in general by the public. The result of this system involves checking the performance of all the parts present under the ACCIOUR system. Firstly, we check for the severity of the accident as in Table- I,

Table- I: Accident severity Check

CONTROL	On the Basis of	GPS to MAIN SERVER	RESULT	COMMENT
Driver	ON/OFF Button turned : OFF	No	NOT a severe accident	Further circuits breaks as the driver confirms that the accident is not that severe.
	ON/OFF Button turned: ON	Yes	Severe accident	Sends the location by assuming that the driver failed to turn OFF the button.
Accelerometer	Less Number of vibrations	No	NOT a severe accident	Further circuits breaks due to the results found by the accelerometer.
	Vibrations reach the threshold	Yes	Severe accident	Sends the location of the accident since the high amounts of vibrations are encountered.
Tilt Module	Horizontal position of the vehicle	No	NOT a severe accident	Horizontal position tells that the vehicle is in the right condition
	Horizontal and tilted	Yes	Severe accident	Even a little tilt sensed can be due to the vehicle getting damaged and hence sends the location
	Vertical	Yes	Severe accident	Sends the location assuming that the vehicle after accident has turned upside down.

The above table shows us how ACCIOUR system decides whether or not to continue the further processes after accident. Further, once the system confirms that the accident is at a high level it considers the previous results and moves forward by finding an ambulance and sending the same to the location. Once the ambulance starts its journey it takes care of the following as mentioned in Table- II and also draws on the required results.

Table- II: Results drawn from implementation within the Ambulance

COMPONENT	ACTION	RESULT
RFID Transmitter	Switches ON	RFID Reader can detect ambulance and informs the traffic signals to go green.
Heart-rate/Pulse sensor	Attached to the body part of the injured	Determines the rate at which the wounded person's heart is beating.
Thermistor	Attached to the body part of the injured	Determines the body temperature of the wounded person.

Finally, ACCIOUR system also plays a vital role using the GSM Module by informing the dear ones about the accident location and the same in the ambulance is used to send the complete report of the injured person to the hospital so that they can be well prepared for operating their patient who is injured. Table-III shows the various results drawn from the GSM Modules implemented within the vehicle and ambulance.

Table-III: Results drawn from implementation within the Ambulance

COMPONENT	AS	TO	RESULT
GSM Modules	SMS	Emergency contact number	The number saved as the emergency contact number initially gets the location of the accident.
	Report	Hospital	Hospital gets the wounded person's medical details while the ambulance is on its way to the hospital.

V. CONCLUSION

The ACCIOUR system gives an insight into how the IoT technology can be used to incorporate into a system to save many lives after an accident. It's a complete system to detect the accident both the severe and the non-severe ones. Based on the severity, the system sends the location of the accident to the main server and hence from the server the ambulance is sent to the accident location. Further, the traffic signals are also controlled to help the movement of the ambulance faster by making the traffic lights go green when they are either travelling to the accident spot or rushing on the way to the hospital with the injured people and reach the hospital in time and help the patient to survive. Hence, this is a complete system that assists right from the moment an accident occurs to the point where the injured people from the accidents are admitted to the hospital. This system is also named in as a life saviour system as it improves the percentage of saving one's life after a tragic accident. Because at the end of the day all that matters is to be alive for ourselves and for our loved ones.

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