

Traffic Monitoring and Life Safety Ensuring System Based on IoT and Agent Technology

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Abstract—Traffic disorders are being increased day by day. And so, accidents are occurring and many lives are being lost. If the problem doesn't get solved, accidents are going to take place and make catastrophic damage. This problem needs to be ended up with a better solution. In the field of Internet of Things (IoT) and Artificial Intelligence, this problem can have a better solution. By implementing IoT and Agent Technology, this problem can be solved effectively. Different types of sensors installation will make the job easier. With the solution, the vehicles can be tracked and monitored to observe the behaviour and adequate actions can be taken accordingly. Thus, the problem as well as damages will be reduced with less human efforts.

Index Terms—IoT, Artificial Intelligence, Agent Technology, Sensors

I. RESEARCH CONTEXT

In this modern era, the life of people has become very busy. There is urgency everywhere. People needs to communicate every time for professional jobs or some other reasons. Again, journey to place to place has become very necessary part in daily life. For this reason, the huge populations are using a vast number of vehicles now a days. For this reason traffic problems are increasing day by day. These problems includes accidents. Again these accidents are making lots of loses and damages as well. People are losing their properties for traffic issues. [1]. The problem has been turned into a big deal in this time. Besides, some anti-social people are also using vehicles for their crime deeds. This problem needs to be ended up with a better solution. In the field of IoT and Agent Technology, there are better solution to solve this type of problems.

Internet of Things abbreviated as IoT is a popular name to everyone. This field has a huge range in this world. In the scenario of modern telecommunications, IoT is rapidly gaining ground. [2]. IoT is a system where different kinds of objects can be controlled via network without human to human or human to computer interaction. For this system, every objects needs to have a Unique Identifiers (UIDs) as a key and connected through Internet. The whole system is controlled by computer. This technology is going to play a vital role to solve the problem. NIC predicted that, IoT has a possibility to cover everyday things in future. [2].

Another technology that is going to be used to solve the problem is Agent Technology. This is a blessing of Artificial Intelligence (AI). Agent Technology refers to a Agent that will control everything. A agent is something that perceives from and environment through sensors and make actions accordingly through actuators. The Agent is needed to be more rational. Rational Agent thinks logically and acts accordingly. There are mainly four types of agents in agent technology. In this case, Simple Reflex Agent can be used. A Simple Reflex Agent perceives each time from the environment and make actions. Besides, the environment is also partially observable. In this type of environment, Agent doesn't have the whole information of the environment. The whole system is a Multi-Agent system and Co-Operative. It means the environment has multiple Agents (Ex. Multiple Cars) and every Agents co-operates each other. [5]

There are some existing solution related to this proble.

A paper has been proposed by Salman Almishari, Nor Ababtein, Pranja Dash and Kshirasagar Naik that ensures an efficient energy with low latency tracking system. This paper includes technologies like Tracking Chip, Cloud Network and Smartphone Application System. The Chip has been installed inside the vehicle to track some parameters like temperature, location etc and sends data continuously to the cloud server. All these things are controlled by Smartphone Application. [3]

Another related solution has been proposed by S.R. Nalawade and S. Devrukhkar which is a Bus Tracking System using Raspberry Pi on Google Map. This has been made both for Web and Android Application. It also includes some sensors like GPS, GSM, GPRS module etc. The goal of this solution is to predict bus arrival time for students. [4]

To solve the problem of this research, the work has already began by combing both IoT and Agent Technologies and many others. The aim of this research is to make it more efficient and go further beyond of existing solution.

II. RESEARCH QUESTIONS

For every research, a proper guideline is needed to make the job successful. Some Research Questions can do the job. Research Questions act like catalyst in research. It helps to

focus on from where the Research will be started. It also assists moving on next tasks step by step. It is the center of the research. As mentioned before in I, the problem is traffic disorders. So, everything will be centralized in this topic. Some questions have to be built up which will be needed to be answered for finding out the details by exploring. To solve this problem, at first, we have to know why the problems are arising.

- Why people don't follow traffic disciplines strictly?
- Why people make rush while driving vehicles every time?
- How the solution is going to impact on current situation?
- What can be achieved after implementing the solution?

If the answer of this questions needs to be found out by proper approach. The approaches have broadly been discussed in section III.

III. RESEARCH APPROACH

A. Data Collection

The first approach of this research is Data Collection. It has to be known why people are too lazy to follow traffic rules strictly and why they are always in a rush every time. An interview session needs to be included to collect data. Some group of people who leads very busy times in their own life needs to be interviewed.

The interview will be taken in an ad-hoc manner. The purpose of this interview is to find out exactly why those accidents are taking place. What reasons are acting behind those unexpected accidents. The busy people leads very busy time in their life. They have a massive bunch jobs everyday to complete. But they do not get enough time to complete everything in time. So, they may always rush every time. It has some possibilities that, they may not have proper sense while driving. Even they may not care traffic rules while driving their vehicles in a rush. And perhaps for this reason, accidents take place and makes lots of damages. By interrogating some of those people, a conclusion can be made up with necessary data related to the reasons behind the accidents.

B. Study on the Technologies

A better idea with both theoretical and practical knowledge of the technologies mentioned in section I must be gathered. This is the most prioritized and most important approach for this research. The technologies are IoT, AI, Agent Technology and some other technologies so far. A good knowledge must be known on how they needs to be programmed to reach to the goal and practice accordingly.

Why this approach? This approach will lead to implement the solution in a better way. Like, without the knowledge of those technologies, how it can be possible to implement? A bit discussion has been written in in section I. Why is it needed is to elaborate the science behind those technologies? What is the big deal here? As the problem is increased number of accidents now a days and the goal is to reduce

accidents and ensure life safety, any tiny mistake can make a catastrophic loss of the people. The solution is related to the real life environment. In previous researches related to this topic, everything has been done with proper care so that the solution may not create another big problem. So, this time, the same thing will be followed but in a more efficient way.

Now it is time to discuss how to use these methods. Well, for the 1st approach discussed in III-A is to make a list of target people. Study one their lifestyle and see how much they are busy. Of course, a large number of people will appear. But it is not possible to reach to everyone and interrogate them. so, in some particular areas that have a heavy quantity of accidents that took place before. The areas needs to be marked and select the people from here. It will be narrow this this, easy to interrogate and collect necessary information. As mentioned before, those people are very busy, so interview will be done as a street interrogation. After combining every bit of information, the reasons behind the accidents can be gathered.

Secondly, the study on the technologies can be done by researching on them. Each and every technologies must be studies well to do further practice. Then a simulation session must be added to see how do they work and hence enhance the perfection. The agent technology can be practiced in a local environment to check if they are working properly. As Agent Technologies require sensors to perceive and actuators to do actions, all the sensors and actuators must be collected to do the simulation. All the components have to be checked well if they are working correctly or not. For this reason, a good circuit knowledge must be acquired. Without circuit knowledge, the conduction of sensors and actuators can't be done. Again, a good computer programming is also needed. As Agents functions are implemented by Agent Program and Agent Program is programmed with programming language, so, programming practice has also been included in this study session. Thus, the whole Agent can be simulated in a local environment. After that it will be combined with IoT and the performance will be checked.

After all their are many challenges in these approaches. In reality, about the interrogate session that has been discussed before is not too easy. As mentioned earlier, the targets are busy people. So busy people may not have time to attend the session. It is hard to convince them to help in the interrogation session. Even if they answer, they may not answer properly for their short amount of time. Again some people can have intentions to not to answer the questions. They may not care for any solution. Some high profiled persons can be tempered while interrogation. Some anti-social people who always make rush for their anti-social works won't open their mouth for their own sake. They won't like to expose their crimes in front of interrogators. So the accurate data collection is quite hard enough in this case.

Again in the 2nd phase, lots of knowledge is required to

complete the study. IoT and Agent Technology is not very easy studies. Very high education is needed to study on these topics. IoT requires a better knowledge in network sector. Every single topics under networking must be studied well to reach to the next level. on the other hand, Agent Technology is another higher level study in Artificial Intelligence. Study on Agents' properties, characteristics and procedure is need. This also requires both programming and hardware knowledge. Without a higher knowledge on these, the solution can't be completed. To gain those knowledge, very intensive struggle and huge practice is needed. After that, there must have a simulation session to check if the Agent is thinking rationally and working accordingly. If it does, then it will be combined with a network for the ultimate solution. If it does not, then lot's of iteration of the whole process form the beginning is going to be needed. So, the approaches are going to make quite a great deal.

IV. SIGNIFICANCE OF RESEARCH

It is already known that the purpose of this research is to make a solution for reducing traffic accidents and ensuring safety of life. Hopefully The system that is going to be made to solve the problem will perform well. A blueprint of the tasks that the whole system will perform is going to be discussed in this section.

- 1) A circuit will be made up with sensors which will be installed in the vehicles.
- 2) The circuit is going to play the role of the Sensors and Actuators of Agent.
- 3) This agent is a Simple Reflex Agent that will work in a partially observable environment.
- 4) The Agent will perceive inputs each time from the environment. For example, it will detect nearest objects, measure latitude, longitude and altitude every time.
- 5) If any abnormal scenario is sensed, it will make actions through actuators. The example of the action is an alert massage for first phase.
- 6) In the next phase, the agent will track the nearest police station to send the vehicle location for suspecting.
- 7) In the last and critical phase, an notification will be send to the nearest hospital to reach to the spot to rescue the victim if accidents take place.
- 8) Each vehicles will have a Unique Identifier using IoT technology.
- 9) The location can be traced by GPS sensor and the alert messages will be sent through GSM technology. It will ensure the safety of life.
- 10) This will also ensure traffic discipline.
- 11) In normal scenarios, the everything will be fine.

Now it can be said that, why this research in this time. Well, the reason for this research in this time is:-

- 1) The cases of accidents have been increased in a huge number.
- 2) People are losing their valuables for this reason.

- 3) Sometimes the damages are so catastrophic that is becomes beyond description
- 4) Loss of life is something that is unrecoverable.
- 5) The careless acts of people for obeying traffic rules and laws have been increased.
- 6) People are using too much vehicles that are beyond count.
- 7) Sufferings of the people have crossed the boundary limit.
- 8) The urgency of people is growing day by day.
- 9) Now a days people wants to lead a comfortable life coming out of busy times.
- 10) The technologies that have been used in the solution has been developed well in the recent times.

After thinking all of those issues, it can be said that, this the high time to work in this research and provide an efficient solution to ensure accident reduction and life safety.

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