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Girl Child Safety using IoT Sensors and Tabu Search Optimization

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Abstract: ***"Smiling face of every girl child is presence of God". In recent times there are lot of issues in security of female children that too especially under the age of 10. Hence forth to assure the safety of every girl child I propose a novel approach which ensures the safety of a kid. In recent times there are huge advancement and development in field of wireless networks. I assure safety of each girl child by a small wearable IoT sensor embedded with a GSM kit. IoT sensors monitor the pulse, heartbeat and pressure of the kid and using GSM I can assure the location of the kid. I fix upon a particular value in the sensor so that if there are any upnormal conditions as well as there is a change in the location of the kid there will be a message alert to the people and the nearby police location. The nearby location is traced by Tabu search optimization.***

Keywords: ***Sensors, IoT, GSM, Tabu Search Optimization.***

I. INTRODUCTION

Girl child safety is the most prominent and imperative aspect that has to be concerted in every one's life. Thomson Reuter's foundation in June 2019 released a study that India has been ranked as the most dangerous country against Child's safety measures due to its high incidences of sexual violence. It has brought insecure feelings in the minds of women for their younger wards. Hence it has been urged to save a girl child in order to preserve their existence on our earth. With respect to the words, "An ounce of prevention is worth a pound of cure", we propose a novel optimistic routing technique using IoT with sensors to achieve the security and safety of girl children. IoT has become one of the primary requirements in our daily life. The objective of this approach is to rescue the girl child from danger as early as possible by filtering out the shortest route to the victim. For every female child we give them a wearable sensor and a small GSM kit using which we could monitor the security and safety of the child. With help of GSM we get regular updates of nearby location of the child.

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IoT sensors are used to record the heartbeat and pressure of the kid. While the child is in an abnormal situation, a message is sent to the Parents, Teacher, Head Master and nearby location police station. We fix a threshold value for the sensors such that either if there is a deviation in the values or if the child is travelling in a different route, then the message would be sent to the concerned mobile numbers. The nearby location is traced using Tabu Search Optimization.

There may be lot of techniques such as smart watches, mobile and gadgets which all are used by older kids and women. But the small kids do not know to use gadgets and also if she is a victim in any such cases, her smart watches are thrown away. Moreover many a schools does not permit mobile accessories so that the kids cannot be easily traced. But in my method the kit is a small wearable device embedded with GSM which cannot be easily traced. The GPS embedded in the kit sets the nearby location of the police station so that the child can get help very sooner.

II. SENSORS

A sensor is a apparatus that is talented to sense changes in an atmosphere. A sensor is intelligent to compute a physical occurrence like temperature, pressure, and so on and renovate it into an electric signal. These three features should be at the base of a good sensor:

- It ought to be susceptible to the experience that it procedures.
- It be supposed not to receptive to other corporal phenomena.
- It must not amend the precise phenomenon during the extent process.

A sensor can be illustrated using numerous properties, the most important being:

- Range: The greatest and least values of the observable fact that the sensor can measure.
- Sensitivity: The smallest amount change of the measured parameter that causes a noticeable change in output signal.
- Resolution: The bare minimum change in the experience that the sensor can detect.

III. INTERNET OF THINGS

The Internet of Things lukewarm to the ever-growing network of physical objects that mannerism an IP for internet connectivity, and the communication that illustrate in close proximity to with insinuation to in the midst of these objects and surplus to requirements Internet-enabled devices and systems.

The Internet of Things coagulate internet connectivity further on of traditional devices like desktop and laptop computers, smart phones and tablets to a assorted array of devices and everyday paraphernalia that demolish embedded technology to cooperative and associate with the external environment, all via the Internet.

IV. GSM

Global System for Mobile communication (GSM) is a digital movable complex that is extensively dilapidated by mobile phone users all from swearing in to end in the world. GSM inhabit a dissimilarity of time division multiple access (TDMA) and is the most ad nauseam used of the three digital wireless telephony technologies: TDMA, GSM and code-division multiple access (CDMA). GSM digitizes and squeeze data, then hurl it down a channel with two other inundation of user data, each in its acquire time slot. It rouse at either the 900 megahertz (MHz) or 1,800 MHz frequency band.

V. TABU SEARCH OPTIMIZATION

Tabu search was commenced by Fred Glover as a high fragment of algorithm that exploits unequivocal heuristics to guide the search. The intent is to apprehend an intellectual journeying of scrutinize space that would eventually shun receiving spellbound into local optima. Tabu status is unambiguous to pledge being visited. The decisive features of TS method are adaptive memory and responsive exploration. Adaptive memory takes dazzling decisions and harmonious exploration is based on unparalleled solutions in lingering time run in search space. TS method mechanism both on short and long term recollections to administer tabu status and direct the search. For a given elucidation s, the neighborhood of s, symbolize by ϰ(s), is defined as the set of sensible solutions accessible from s by applying

$$ϰ(s) = \{ ś | ś = m(s), m \epsilon \mathcal{M}(s), ś \epsilon S\} \quad (1)$$

Where S is the resolution space, $\mathcal{M}(s)$ is set of organization that can be engender from solution s and m denotes a movement to be applied to s.

5.1 Tabu Status

The prime use of tabu status is to evade visiting solutions previously stopover during the search. A tabu list is thus luxurious to crack in press forward visiting solutions. Tabu status is a subject to precautionary condition if unaffected over long duration of time. We define a set of permissible solutions which are the set of solutions of neighborhood by excluding Tabu are called aspiration criteria.

Admissible (s) = {(ϰ(s) – ŧ(s)) ∪ Aspiration(s)} (2)

Where ŧ(s) is the movement of Tabu reachable from s:

ŧ(s) = { ś | ś = m(s), s εS, ś ε S, m εvM(s), $is_{tabu(i,m)} = true$} (3)

and we have aspiration(s) is set of tabu whereabouts satisfying following criteria:

aspiration(s)={ś|ś=m(s),sεS,ṥεS,mεvM(s), $is_{tabu(i,m)} = true, aspirate(i,m) = true$} (4)

5.2 Tabu Search Procedure

Step 1: The process is started with an intial solution s. Initialize ś equals to s. Reset tabu and aspiration conditions according to the requirements.

Step 2: Until the process reaches the end, generate subsets of the solution such that none of the tabu conditions gets violated as well as aspirations conditions gets satisfied. Choose the best ś from the neighborhood solution. Copy the value of ś to s.
Step 3: If there are any improvements in ś the value gets changed or else the value remains constant.
Step 4: the redency and frequency values get updated and there is a check for intensify condition, if it's true the values are processed else condition for diversify is checked.
Step 5: returns the value ś
The purpose of this algorithm is the TSO returns the best neighborhood value and hence the delay is minimized since the value travels in the shortest path.

5.3 Neighborhood Exploration

It consists of investigate solutions that are slam to fashionable solutions in search space. In TS the environs solutions are in energetic structure in hunt process. The exploration method second-hand is steepest descent-mildest ascent. The itinerary of action of this scheme is if there originate to be an allowable solution in neighborhood with superior fitness function than the recent solution, it is acknowledged as consequently solution, an permissible solution springy least degeneration vigor value is established. They are not tabu as well as they don't gratify aspiration criteria.

5.4 Long Term and Short Term Memory

Long term memory is also called occurrence accumulate in sequence congregate during the whole exploration procedure and short term memory called recency stores information of recently visited solutions. The main principle is to avoid revisiting if nodes during search process. This is implemented by Tabu cargo space entity which uses Tabu list Γ for frequency. For current solution s, only neighborhood solutions from ϰ(s)-Γ will be the next solution. The foremost objectives of Tabu solutions are to avoid cycles in the search.

5.5 Intensify and Diversify Procedures

The itinerary facilitate to either investigate the resolution space fully in the neighborhood of a solution is called intensify, the major aim is to deeply explore talented areas of solution space and the route of poignant the search to other areas of solution space is called diversify, it endeavor to medication one of the main concern in local search methods, named as "locality" of search it does not explore certain areas of search space.

VI. PROPOSED WORK

We name my wearable IOT kit as Smrithi Sarvaabhayavartha which means safety to all girl child. I swear safety of each girl child by a small wearable IoT sensor embedded with a GSM kit.

IoT sensors monitor the pulse, heartbeat and pressure of the kid I fix upon a particular value in the sensor so that if there are any up normal conditions as well as there is a change in the location of the kid there will be a message alert to the people and the nearby police location. The nearby location is traced by Tabu search optimization.
Using Tabu nearby police station is alerted along with parents, teacher, and headmaster numbers so that the victim can be traced and be saved.

6.1 Block diagram of Proposed System

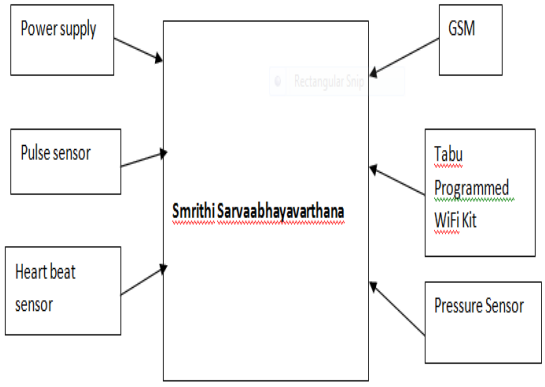


Fig 1: Block diagram of IOT Kit

The Figure 1 describes about the block diagram of the kit. It si connected with 3 kinds of sensors, one to monitor pressure, one to monitor pulse and one to monitor heartbeat. It contains a small power supply to activate power. It contains GSM kit and a Wifi kit programmed with tabu search to trace nearby location.

6.2 Architectural Diagram of Proposed Work

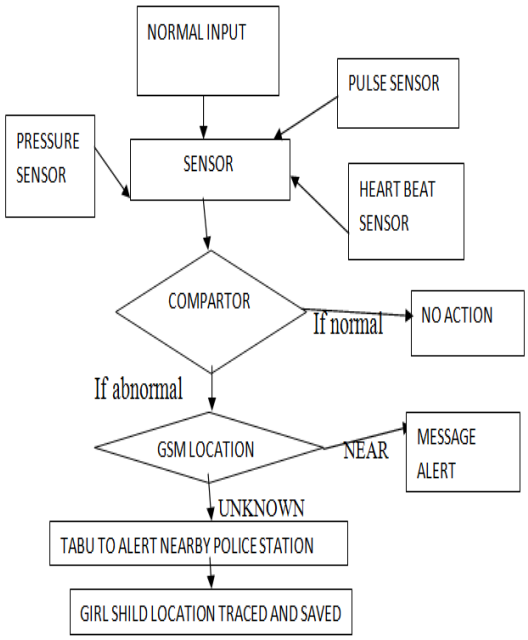
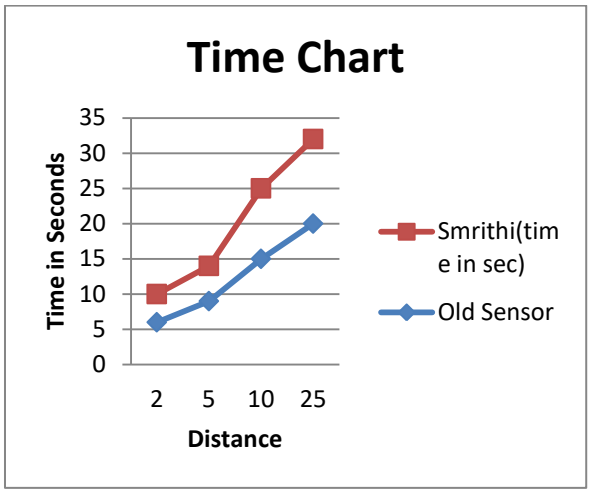


Fig 2: Architectural Diagram

VII. RESULTS AND DISCUSSION

When we compare the previous techniques they were having location sensor but message could not be passed and moreover sometimes there is a possibility of wrong sensor values when child travelling in tour or in with family and friends. Whereas in our method, there will be IOT sensors which continuous monitoring of data and also location sensor which indicated when in wrong time.
The following table indicates the location trace of previous method with new Smrithi.

Distance in meters	Old Sensor(time in sec)	New method (Smrithi) (time in sec)
2	06	4
5	9	5
10	15	10
25	20	12



VIII. CONCLUSION

The proposed system enhaces the safety of girl child and also it can be easily traced by nearest police location or nearest help location. The child can be easily saved as the nearest location is updated.

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