Enhancing the Women Commute Patterns with IoT Enabled Transit

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Abstract : In the present work, an attempt has been made to propose a framework for enhancing the commuting strategy and security of women. It involves a wide range of technologies that include natural transportation methods, online services on current procedures, GPS Services, Wireless Sensor Networks(WSN), Internet of Things (IoT) and big data, there by the technologies will enhance the way of women commute. The ICT based framework uses technologies such as smart cards, sensors, voice recognition and biometrics used in industry to help in automating, reducing error and increasing the efficiency of the technology which is of much support for the women community and assists them during their travel. If implemented, this framework facilitate ease, efficient and secured travel for women. We will also try to analyze the women transit data and observe the patterns and provide this information to the government using big data analysis methods.

Keywords: *Framework, GPS Services, Wireless Sensor Networks, ICT Tools, Big Data, Internet of Things*

Introduction :

The transition of role of woman from the past to present is worth mentioning. Woman who were once considered being the masters in the art of home making are now considered to be the forces that shape the country.

"The hand that rocks the cradle rules the world." according to Albert Einstein. This is the situation where "SHE" stands. The role of modern women is completely changing . She is engaged in many activities. There is no arena, which remained unconquered by today's women.

Over the last two decades, two trends are very visible in most developed economies:

there is a change in the status of women, which is most clearly manifested in their participation in the labor force, and associated with that, women's travel patterns are rapidly changing. Previously she used to depend on men for her travel now it is not the case. She can now be seen working on par with men in every field. After stepping out of her house she has to look at various issues and she is facing many problems during her commute.

As compared with past women in modern times have achieved a lot but in reality they have to still travel a long way. Their path is full of roadblocks. The women have left the secured domain of their home and are now in the battlefield of life, fully armored with their talent. They must avail themselves of the educational opportunities provided and learn to empower themselves.

When we look at who takes public transport, women depend much more on public transport than men. So ensuring their safety and security, their ability to get to their jobs, and to get their kids to school in a safe manner, planning for outstation trips as part of their official works is absolutely essential and we need to focus on .

Government is taking measures to reduce the crime rate on women in public transport. For example women exclusive busses, pink cars in metropolitan cities and buzzers in public transport vehicles.

We as women are the true meters for the current problems faced by women during their travel. To facilitate ease, efficient and safe travel for women we started of designing a framework which would address the needs and safety of women during her travel. Our approach uses a wide range of technologies that include natural transportation methods, online services on current procedures, GPS Services, Wireless Sensor Networks(WSN), Internet of Things (IoT) and big data, thereby enhancing the way of women commute.

We observed all these policies and application products available at present for women security. We feel that it is better to propose one unified approach which can address all the issues related to this and this can be controlled by smart phone. We are going to use Internet of Things for connectivity of all these issues.

The internet of things (IoT) is creating exciting opportunities for the travel . It can connect smart devices, public transport systems, private or personal vehicles, various parking areas in and around their place. It aggregates data during all these phases. Processes it in smart ways. It is also used to streamlining all the activities.

We will analyze this large volumes of data that is big data by latest analytical methods and we are intending to provide this information to concerned government bodies for their decision making and pattern analysis. IoT helps in an excellent manner to turn this information into action.

So using this technology would be beneficial for streamlining the process defined in our framework.

Today in the current global scenario, the prime question in every girl's mind, considering the ever rising increase of issues on women harassment in recent past is mostly about her safety and security. The only thought haunting every girl is when they will be able to move freely on the streets even in odd hours without worrying about their security in a better hurdle less manner.

Since we (humans) can't respond aptly in critical situations, the need for a device(application) which automatically senses and rescues the victim is the venture of our idea.

The proposed Framework "Smart and secure travel for women " aims at enhancing the women commuting behavior by going for the most technologically advanced methods. This ensures increased presence of women in economic activities, availability of safe and reliable transport services.

2. Literature Survey

There were many initiatives taken in different parts of the world for women security.

London's public transport operator, Transport for London (TfL) uses information technology to enhance women's safety. For instance, the Technology Innovation Portal at TfL allows users to submit innovative technological ideas and solutions to meet key challenges, like women's safety. In 2004, TfL created the Women's Action Plan, which called for discounted fares as well as low-floor and step-free buses. TfL consulted 140 women's advocacy groups in London and launched an annual Safer Travel at Night campaign in order to better understand their specific concerns.

Metropolitan Toronto Action Committee on Violence Against Women and Children (METRAC) is a collaborative relationship formed by various community-based women's organizations, the Toronto Transit Commission, and the Toronto Police Department to conduct comprehensive safety audits of the city's transport system. The partnership works to empower women in the community by developing research and policy recommendations based on its safety audits. Then, METRAC engages government actors to create safer neighborhoods, schools, campuses, workplaces, institutions and public spaces. In the past, METRAC has successfully delivered designated transport waiting areas, well-lit parking garages, assault prevention programs, and better safety policies and practices in hospitals and other workplaces.

The Traveling Safely (Viajemos Seguras) program In Mexico City, for example, aims to prevent, address, and penalize violence against women and girls (VAWG) in public transport. The program was developed and is being implemented by several federal and municipal government agencies, including InMujeres DF and the city's Mass Transit System Agency. The initiative includes four main components: service kiosks inside Metro stations where users can seek help or report incidents; training for transport employees, including drivers and operators, on VAWG; delivery of VAWG prevention campaigns in the public transport vehicles and stations; and women-only cars in Metro and bus systems. Fifty-eight percent of the Metro lines and 100% of the Bus Rapid Transit (BRT) lines, for instance, have now implemented the women-only car policy.

The violence against women in India has grown to be a matter of grave concern, cutting across the boundaries of culture, class, education, ethnicity and age. Even in the 21st century, women cannot step out of their house assured of their physical safety.

It would have a coverage ratio of more than a million of the population and aims to aid women in distress with minimum response time. The Safety elements which would be incorporated are: tracking and geo-fencing of all public transport vehicles with visual and text signals denoting violations. Additionally, panic buttons will be installed on all public vehicles along with CCTV on vehicles with large seating capacity.

The CCTV footage will be authorized for use as evidence in the arrest of any individual accused of instigating an incident. The tracking, geo-fencing and panic buttons all require telematics products, making this government project a catalyst for growth of the telematics industry. The project will help in mapping routes of public vehicles, tracking vehicles on routes, highlighting violations through visual and text signals, and a panic button to alert police.

Importance of this Framework in the context of current status.

Today in the current global scenario, the prime question in every girl's mind, considering the ever rising increase of issues on women harassment in recent past is mostly about her safety and security. The only thought haunting every girl is when they will be able to move freely on the streets even in odd hours without worrying about their security in a better hurdle less manner.

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This study exist as different small applications in various platforms and they have their own merits and demerits . Ours is the state of Andhra Pradesh which is newly formed. We made a study on the growth of population in city Vijayawada the capital of Andhra Pradesh and the problems to be faced by the women during their transit due to this growth. There is a huge growth of traffic and the number of people turning towards cities is also getting increased. So there is a dire

need for us to address the safety of women as well as the way they can efficiently complete their task once they are on road.

In general, women specific barriers to safe public transport include fear and experiences of sexual harassment and violence while accessing and using public transport.

Overcrowding, lack of space and information, delay or unreliable public transport services have a disproportionately higher impact on women than men.

Trips made by women either by public transport or by personal transport are typically characterized by off-peak hour trips, trip chaining, higher probability of carrying packages or being accompanied by dependents.

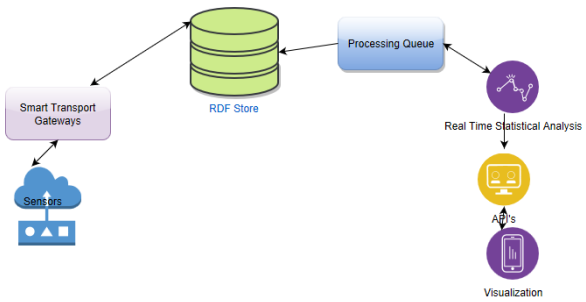
These factors influence quality of women transit.

This has led to the recognition that these challenges must be addressed together rather than isolation from each other.

The general framework architecture:

It gives the overall view of the framework

The sensors fixed at the buses communicate with the transport gateways and store the information in the RDF Store which is a purpose built database for storage and retrieval of triples through semantic queries. The data is being processed in the processing queue and real time statistical analysis is done and data is accessed through API's from the mobiles of the registered users.



The General Framework and Process Flow

3.1 Methodology

The Indian woman of today is harnessing the digital advantage to maximize their potential to realize the goal of a Digital India. Many of the women are owing smart phone and everyone is shifting towards the digital world. However to the best of our knowledge there is no application which is personalized and individualistic , thus catering the needs and safety of women on the roads during their commute

The Men and women use public transport in different ways because of their distinct social roles and economic activities. Since women's reasons for traveling generally differ from men's, the purpose, frequency, and distance of their trips are also different. Additionally, safety and perceived social status play a complex role in shaping women's transport behavior as they move between urban, suburban, and rural areas. Equitable access to public transport is about making the transport system work for women and meeting their need for safe, efficient, sustainable mobility.

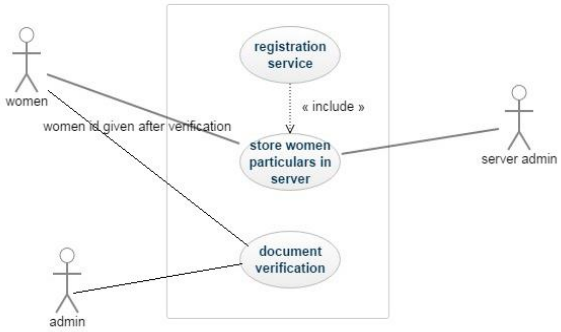
In this study a wide range of services would be provided to women all these services are customized to the needs of women that is the information provided by the mobile interface is to be made used by the women. Various personalized services provided in the proposed work are illustrated in the following sub sections. Some of the important services include

These are the different services provided to the user are:

1. **Registration Service:**

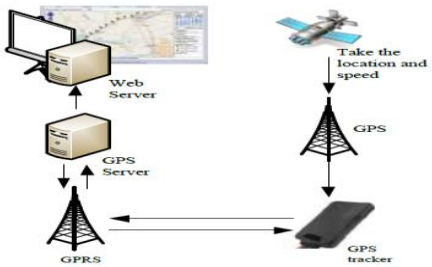
As per the proposed service and as shown in the figure , the women will get registered with registration service and procure a unique women_id meant only for her. The women's particulars like name profession, working hours, emergency number etc will be noted down during the registration process. This data will be saved in server permanently in a prescribed format. This service enables to store women's particulars in the system. This data is important for locating her, sending alerts to her, providing security etc.

Registration Use case:



2. **Traffic congestion alerts and Route Deviation alerts**:

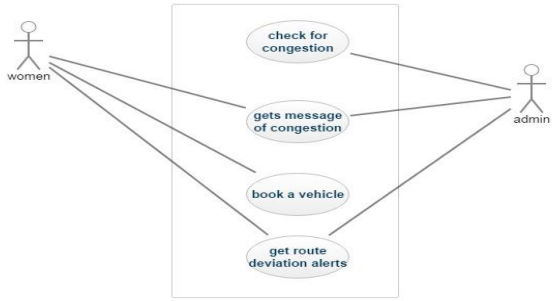
GPS tracker sends the coordinates and speed of data to the server using the IP network. Server processes the coordinates and the speed of data into traffic information, and visualizes this information and sends alerts on to her smart mobile.



Process flow Diagram

3. Vehicle Booking Service:

Vehicle Booking Service Use Case:



With reference to the figure above

In case of traffic congestion or public transit unavailability this service helps the women to make alternate arrangements for travel.

4.Smart parking: assist them in parking their vehicle.

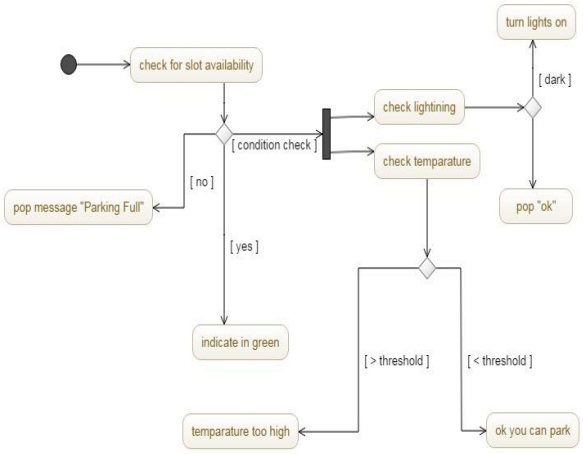
The proposed system is the combination of the hardware and software to form a complete module. Exchanging of all the information or data between mobile and sensor circuitry is done by CLOUD. We will develop an algorithm to define the parking slot allotment.

- Initially selection & checking for car parking is made from mobile or computer using cloud.
- Checks for availability of parking slots. If parking slot is free, the particular slot Number will be popped on to the mobile in Green.
- otherwise "Parking Full".
- It also informs about the conditions in the parking area:

1.temperature of parking area, if it is greater than threshold, then pop will be "Temperature to high".

2.Light of parking area, if it is less than threshold, then pop up message will be" Turn on Light".

Activity diagram



5. **Trip Planner**:

- Selecting the destination
- providing secured routes information based on previous crime rate history of these routes.

We will develop an algorithm that audits the selected routes and bus stops along these routes .

This considers various parameters like lighting, public transport, feeling of safety, gender diversity etc. We use three pins to indicate whether the location is unsafe, slightly safer and safe location.

6. **Security:**

The application is programmed and loaded with all the required data which includes Human behavior and reactions to different situations like anger, fear and anxiety. This generates a signal which is transmitted to the smart phone. The software or application has access to GPS and Messaging services which is pre-programmed in such a way that whenever it receives emergency signal, it can send help request along with the location co-ordinates to the nearest Police station, emergency number and the people or NGOs in the near radius who have application. This action enables help instantaneously from the Police as well as Public in the near radius who can reach the victim with great accuracy.

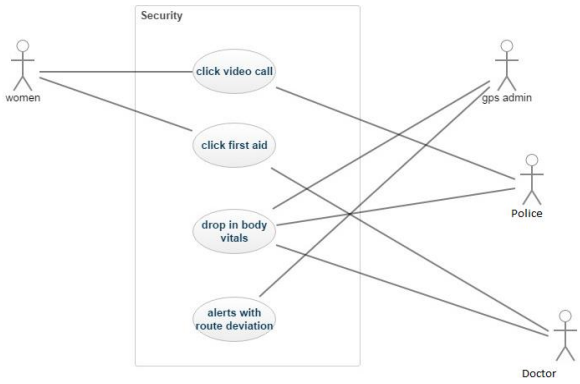
There is another important option in the main screen is video call. This option gives the video of the person that he/she has taken. That is if the person is in danger position that is unable to tell the position then she/he can take the video and share via Gmail.

Another option is the First aid option with which she can get the First aid details for various problems like unconscious and not breathing, choking, bleeding heavily, burns, heart attack, diabetes etc.

This is helpful if she gets any problem during her travel.

If she is commuting in a private cab or auto , if there is any deviation in the route it immediately triggers and sends message to her mobile.

Use Case Diagram:



7. **Data Analysis Service**: Data captured in each and every step will be analyzed using Hadoop and Map Reduce to find out the patterns of women commute behavior and the crime rate on women during their transit.

An algorithm for security of the data will also be developed.

Conclusion:

An unified model will be developed which will address the needs of the women during their commute. Apart from assisting them related to the services like how to make alternate decisions in case of overloaded public transit systems, helping them in the parking areas, assisting them about the traffic alerts , assisting them in making travel plans and finally keeping them secure with the following technology. This will analyze the women transit data and observe the patterns and provide this information to the government using big data analysis methods.

Modern travel for women is no longer going to rely on the bus displays at the bus stops ,having access to tickets only after alighting the bus, women police in the busses, women only transport, CC Cameras etc but focuses on much smarter methods with a much connected travel using Internet of Things to ensure safety and plain sailing for women. We would like to develop an approach on a homogeneous platform that can address all the key needs and safety of the women commuters either using personal, private or public vehicles.

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