Towards The Development Of Intelligent Transportation Systems In Sri Lanka.

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Abstract: Managing the increasing traffic is a big problem in Sri Lanka. The following transport system such as roads, railways, waterways and two international airports are available in Sri Lanka but the country mainly based on the road network. These transportations face many issues like accidents rate, traffic congestion, traffic & carbon emissions air pollution, etc. The idea of Development Intelligent Transportation System (ITS) provides the solution to these problems with the help of new technologies. The paper highlights different systems and also gives the future scope in the field of ITS to make it more user-friendly and accessible.

Index Terms: Intelligent Transportation System (ITS), Sri Lankan Transport.

1 Introduction

The world in the 21st century is growing up in the technology in every field such as education, medicine, transport and so on, the use of technology makes the world so faster and easier than the early world. Traffic maintenance and controlling traffic is the major problem in the developing countries. Each and every country has their own rules and regulations systems to solve the traffic problems. In earlier the density of vehicles has increased on the roads leading to road traffic, jamming and accidents. Traditional mechanisms were used for controlling the traffic like installing traffic lights, traffic signs, traffic policemen, and round-about. But these methods are got obsolete day to day. In the current technology, intelligent and adaptive equipment should be used to control the traffic. The Intelligent Transportation Systems (ITS) is providing the solution to face the traffic problem in the county [1]. The development of Intelligent Transportation Systems (ITS) requires high-quality traffic information in real-time. For several years, under growing pressure for improving traffic management, collecting traffic data methods have been evolving considerably and the access to real-time traffic information is becoming routine worldwide.

1.1 Existing System

In the current era to maintain the traffic problem the following system were used by the government of Sri Lanka Advanced Traveler Information System (ATIS), Advanced Traffic Management System (ATMS), Advanced Public Transportation System (APTS), Emergency Management System (EMS), Transit Management Systems (TMS), Freight Management and Incident Management Systems. Advanced Traveler Information System (ATIS) had a wide variety of technologies, such as internet, telephones, cellular phones, television, and radio. Is used by traffic police department and traffic rules and regulation consultants as a tool to maintain and control traffic by monitoring the flow of traffic and making appropriate decisions in a timely manner. Advanced Traffic Management System (ATMS) Traffic management systems were providing the movement of vehicles, by using real-time information. This kind of system is used by the traffic departments and policies to control the traffic. Advanced Public Transportation System (APTS) is concerned with increasing operational efficiency of all public transportation modes and increasing ridership by making the transportation system more reliable. Emergency Management System (EMS) discipline that deals with risk and risk avoidance". This system deal with natural hazards is those that be in the natural surroundings. The above mention systems were used up to now to control the traffic.

1.2 Use of Existing Flows of Information

There are several sources of travel information which are not being used to their full potential which is, perhaps, the key issue underpinning the debate on the marketable value of information referred to above. For example, the SCOOT (Split, Cycle and Offset Optimization Technique) system for coordinating the timing of traffic signals across a network of junctions – probably the most successful adaptive control system in the world – uses a large amount of detailed measurements and calculations relating to the traffic flowing through the network and the junctions. This could, perhaps, be put to a wider use if it were made available to traffic information suppliers – particularly so as SCOOT systems are currently operational in over 130 cities, towns or boroughs in the UK.

1.3 Proposed System

The real-time travel information display system solutions are based on a fully transparent data distribution platform. Reliable data form the core of any information display system, and we integrate all known brand relational database systems with an external data source as the heart of our display products. Info logic's dynamic display products include Flight Information Display Systems (FIDS), Passenger Information Display Systems for public transport as well as Narrow Casting products for a wide variety of information and multimedia display solutions for retail and hospitality. Due to the modular architecture of our products, all components can be fully integrated to full extension of our display solutions. The advantages of the system More Scalable, Easy to manage, More Flexible, open and safe, Versatile Proven technology, Cost-effective, Low operational cost, and Reliable System.
The following steps involved in the proposed system
Step 1: Trip plan implementation map data
Step 2: Traveler location
Step 3: Ferry service information
Step 4: Rail service information
Step 5: Environmental data updates

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Step 6: Planning
Step 7: Demand management environmental data
Step 8: Environmental data for analysis

2. LITERATURE REVIEW

Henry, L.A., et al. said Intelligent Transportation System (ITS) is a method of combining information technology and other advanced methods with transportation engineering to address transportation problems involving a complex interplay between technologies. In order to compensate for uncertainties in travel time due to accidents, bad weather, traffic congestion, etc., trucks hauling time-sensitive freight build "buffer time" into their routes in order to help ensure that deliveries will be made on time. Building buffer time into routes tends to increase the likelihood of on-time delivery, an important measure of service. However, buffer time also tends to reduce measures of productivity associated with cost, such as driver and equipment idle time and the number of miles traveled per hour [2]. Alexander et al. Suggested providing accurate traffic information is becoming a major challenge for the public institutions and private companies leading to the rapid growth of intelligent transportation system (ITS) [3]. Some research work has already been done by the several authors to reduce the congestion and to control the traffic. According to the authors, there are several reasons which can create the congestion on the roads. For the detection of the congestion, the various authors suggested using smartphones, which has various sophisticated sensors inbuilt. Through the Smartphone's sensors we can collect the information about the particular place.

3. MATERIAL AND METHODOLOGY

The research is to show that real-time traffic information combined with historical Traffic data can be used to develop routing strategies that tend to improve both cost and service productivity measures. More specifically, motivated by situations where time-sensitive delivery is required, we examine the value of a real-time traffic information technology (IT) on vehicle routing. We present a systematic approach to aid in the implementation of transportation systems integrated with this real-time IT. To this end, we consider a stochastic shortest path problem on a road network composed of links having non-stationary travel times, where a subset of these links is observed in real-time. We assume that each observed link can be in one of two states (congested or uncongested) that determines the travel time distribution used. The National Intelligent Transportation Systems (NITS) Architecture has identified 32 different services that are bundled into eight user service areas: 1) travel and transportation management; 2) public transportation management; 3) electronic payment; 4) commercial vehicle operations; 5) emergency management; 6) advanced vehicle control and safety systems; 7) information management; and 8) maintenance and construction management. Communications networks are among the fundamental structural elements that make up an intelligent transportation infrastructure because they serve as the paths ITS services use to access and share information. These networks link disparate ITS applications to each other and to centralized management centers, allowing for the key functions of data gathering, synthesis, delivery, and broadcast to occur in real time. Because of their importance to ITS, the NITS architecture defines five distinct modes of communication to support its diverse collection of applications and services: Vehicle-to-Vehicle Communications, which will someday endow vehicles with collision-warning and avoidance capabilities and will play a critical role in automated highway systems.

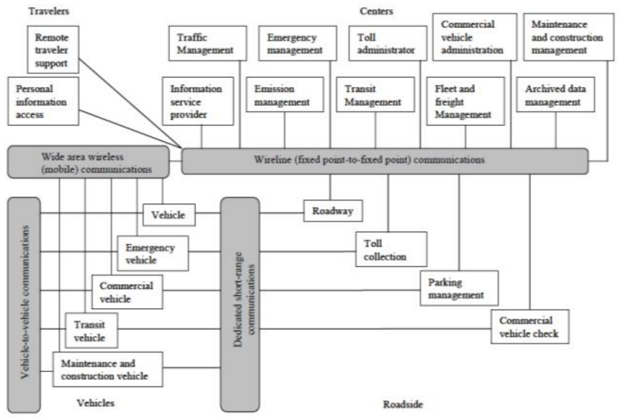

Fig. 1: *National ITS Architecture Subsystems and Communication*

3.1 Using the real-time data

Facilitate the online simulation, the detector data must be received and processed. Therefore, the simulation system must be supplemented with an additional functionality called state estimation [4]. The state estimation reads the detector data and takes necessary actions on the simulation model to maintain consistency between simulated and measured traffic [5]. The solid basis for the successful state estimation is a good off-line simulation model that defines the layout, statistics and vehicle dynamics of the simulated traffic system [6]. In on-line simulation, some of the distributions can be replaced by actual real-time data, when available from detectors. The accuracy of the online simulation depends on the amount and quality of the detector input data.

3.2 City Information Systems

An integrated approach to variable signing and the live information is provided about the Sri Lankan Cities to this system, which has at its heart a Town Traffic Control system, takes information from a number of sources and makes it available to all categories of road user. Variable Message Signs are used to providing information about the number of car park spaces available in the city, traffic flow and congestion on major routes into, out of and around the city and real-time passenger information at bus terminals and bus stops.

How do they work integrating the on–travel information? Attention is currently being given to the delivery of an integrated flow of information to all the access points mentioned earlier. This can be done by (a) setting up an effective server processing system at the point of origin to ensure consistently high quality information (e.g. police monitoring of information about traffic incidents and congestion) then, setting up a computerized information server, which is programmed to select information from a variety of sources and provide a series of messages which are delivered on demand to the various access points.

3.3 IBIS Unit

Maps and Journey information: In line with the Government's direction to encourage walking and cycling, additional maps relating to cycle routes and walking distances and times to points of interest can be added to the display page portfolio.

IBIS is ideally suited for wayfinding and personal navigation within large towns and Cities Travel Information: Unlike standard three line LED displays, IBIS can be configured to display real-time for all services and operators running from that stop on the one screen. Users are able to drill down using the touchscreen display if they require further details relating to a service or operator [7]. Customer Information: IBIS is able to receive and display up to the minute, bespoke delay and service disruption notices - security alerts, descriptions of missing persons, requests for witnesses of accidents can all be created and displayed at a moment's notice [7].

3.4 The Benefit IBIS

The IBIS is cost-effective, provides up-to-date schedules and remote access for monitoring, management and messaging, Low cost of ownership ensured through careful choices of components and technologies, automated schedule updates, thus eliminating labor-intensive visit to stops, Virtual server allows up to 1,000 displays on street [7, 8]

3.5 Design of ITS Solution.

Colombo Municipal Council (CMC) The complete list of user needs attributed to the development of the system proposed in this report general objective of the system is to be able to warn the host driver and nearby drivers A visual representation of the system (Figure 2) components are given the system incorporates a number of different user needs and aims to solve a variety of issues that may arise but to summarize, the requirements are (code numbers are given)

1) The system shall be able to provide in-vehicle general (dynamic) PT information, as well as the arrival time at, and the name of, the next stop for this vehicle. (10.4.1.1)
2) The system shall be able to provide an update of arrival/departure information in real-time and present it to travelers of that mode before and during the journey. (10.1.4.3)
3) The system shall be able to analyses records of usage and operational data, and passenger surveys, to assist in the planning process. (10.1.0.4)

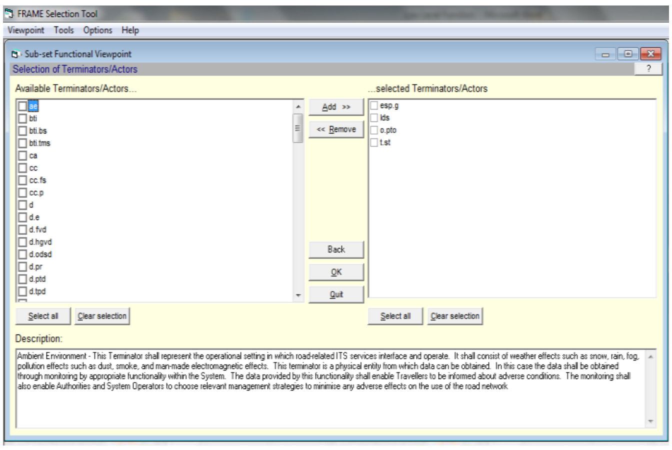

Fig. 2: *Visual representation of the system.*

3.6 User need code number of Intelligent Transportation System

This Intelligent Transportation System (ITS) solution have main Six functions and this system is incorporated with basically ten user needs according to the functions needed. The following table 01 shows that summarizes relevant user needs and description.

Table 1: *Selected user need*

User Need	Description
10.4.1.1	The system shall be able to provide in-vehicle general (dynamic) PT information, as well as the arrival time at, and name of, the next stop for this vehicle
10.1.4.3	The system shall be able to provide an update of arrival/departure information in real-time and present it to travelers of that mode before and during the journey.
10.1.0.4	The system shall be able to analyses records of usage and operational data, and passenger surveys, to assist in the planning process.
10.1.2.2	The system shall be able to monitor the number of travelers waiting at a pick-up point, e.g. Park and Ride site.
2.1.0.1	The system shall be able to exchange traffic and travel information between adjacent TICs to enhance local information
10.1.4.2	The system shall be able to provide information about a PT service to the travelers before and during the journey.
10.2.4.1	The system shall be able to provide statistics of usage
10.1.4.1	The system shall be able to inform travelers about PT operations for a mode of transport, e.g. travel times, delays, fares etc.
10.2.4.2	The system shall be able to provide statistics on how well it actually satisfies its customers, e.g. response times, for reporting to its users.

3.7 Intelligent Transportation System Function

After the frame tool operation, it suggests finally main functions. The main functions are a description in Table 2. The function facilities and the functional requirement details are shows below

Table 2: *selected function.*

Function number	Description
4.1.6	Predict Vehicle Timings
4.1.9	Output Arrival Information to Passengers
4.1.11	Manage PT Vehicle Stop
4.1.12	Output Service Information to Travelers
4.1.8	Calculate PT Service Performa
4.1.13	Provide Operator Interface for Manage PT Fleet
4.1.5	Collect PT Vehicle Data
4.2.7	Manage PT Route Data Store
4.2.8	Plan New Service Schedule
4.1.15	Provide PT Vehicle Driver Interface
4.7.4	Monitor On-Demand Service Vehicle
4.7.5	Provide On-Demand Service Operator Interface
4.5.3	Provide PT Passenger access to Fare Credit

3.8 Terminator or actors in the Intelligent Transportation System

Then the first time keen eighteen errors. Then after solving that it shows ten warnings. Then second-time keen six errors. Then after solving that it shows four warnings then finally come up with the no error and no warnings.

- Geographic Information Provider (esp.g)
- Location Data Source (lds).
- Multi-Modal Management System (mmms)
- Environmental Traffic Management System (etms)
- Public Transport Management System (ptms)

Geographic Information Provider (esp.g) : This Actor within the External Service Provider Terminator shall represent a provider of digitized map data that shall be for use in vehicles and where ever information or data output is to be shown against the background of a map. Location Data

Source (Ids): This Terminator shall represent external entities that provide data to the System from which its location can be determined. Typically, this data shall be provided continuously without requests being made by any of the receiving Functions within the System. The data shall be used by these Functions in the determination of the position of Vehicles and Travelers within the road network managed by the System, e.g. when the location of a Public Transport vehicle is needed to determine if it requires priority at junctions controlled by the System. The actual identity of the source of the data is not important, but it could for example be GPS, or in the future perhaps Galileo. Public Transport Operator (o.pto): This Actor within the Operator Terminator shall represent a human entity that uses the facilities of the system to manage the provision of Public Transport services. The system may be in communication with more than one human entity that is a Public Transport Operator. Each entity may all belong to the same Public Transport organization, or to different organizations. Static Traveler (t.st): This Actor within the Traveler Terminator represents a human entity that is using the facilities of the system for a journey but is at this moment not moving, i.e. static. For the Traveler to be in the state assumed by this actor, they shall be stationary, either waiting for their trip to start, e.g. at a bus stop, or within a transport facility, e.g. a car park or service area. The system may be in communication with more than one human entity each of which is a Static Traveler.

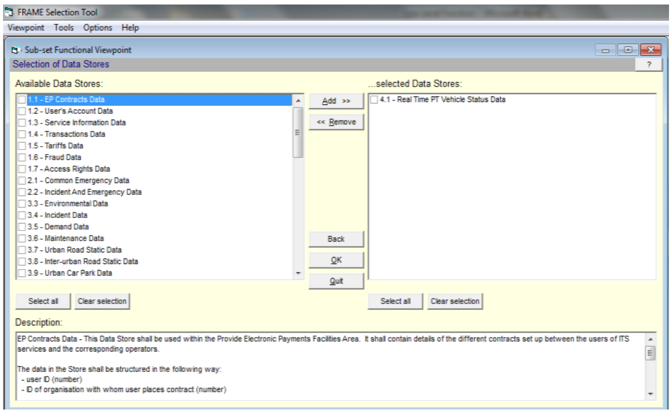

Fig. 3: *Intelligent Transportation System*

3.9 Logical architecture of the system

The logical architecture illustrates (Figure 4) the ITS system architecture at many levels of detail. The logical architecture aims to explain the configuration of services, without worrying about how it will get done. The logical architecture takes the form of a series of data flow diagrams (DFDs) which depict logical processes (shown as circles), entities (rectangles), and data flow (arrows), and data stores (logical data files, shown as a name between parallel lines).

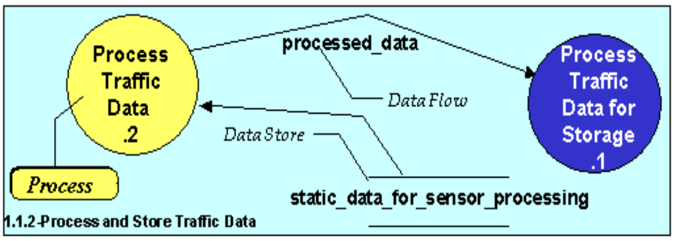

Fig. 4: *Logical architecture*

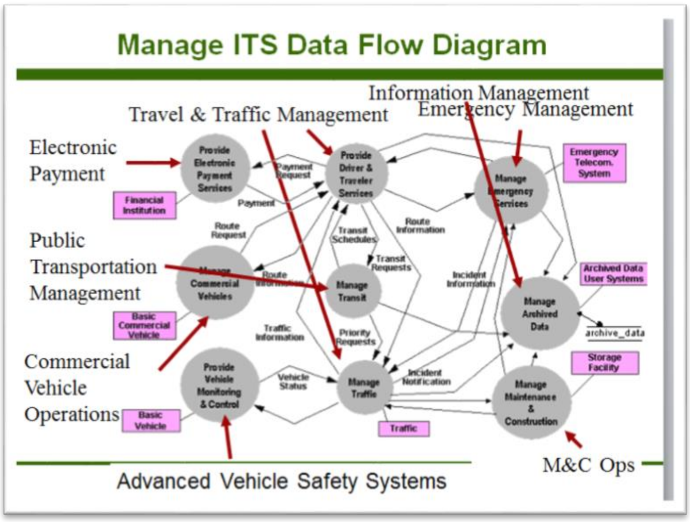

Fig. 5: *Manage ITS Data Flow Diagram of the ITS Architecture*

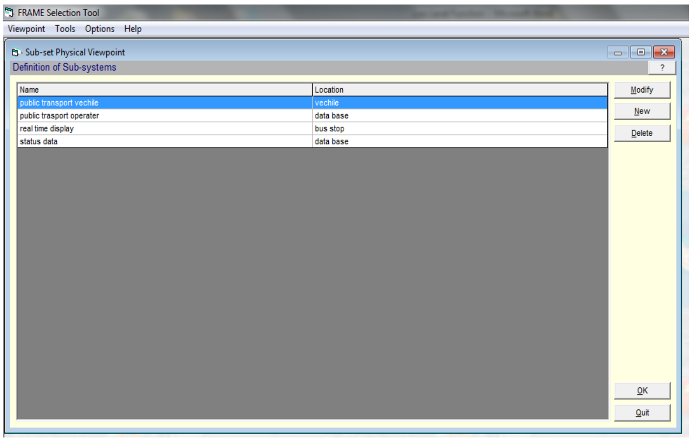

Fig. 6: *Physical view point of ITS*

3.10 Physical architecture

The physical architecture is a physical representation of the important ITS interfaces and major system components. The Principal elements in the physical architecture are entities and architecture flows that connect these entities into an Overall structure. The physical architecture assigns processes from the logical architecture to subsystems, and group's data flows from the logical architecture into architecture flows. These flows and the corresponding communication Requirements define the interfaces which are the main focus of ITS standards development Vehicle group consists of five different types of vehicles. The traveler group represents different ways a traveler can access information on the status of the transportation system. There are four different types of communication systems.

- Fixed point to fixed point
- Wide area wireless
- Vehicle - vehicle communication
- Field - vehicle communication

Through the communication systems, all the subsystems are interconnected and transfer the required data. Figure 07 shows the subsystems and communications that comprise the national physical architecture

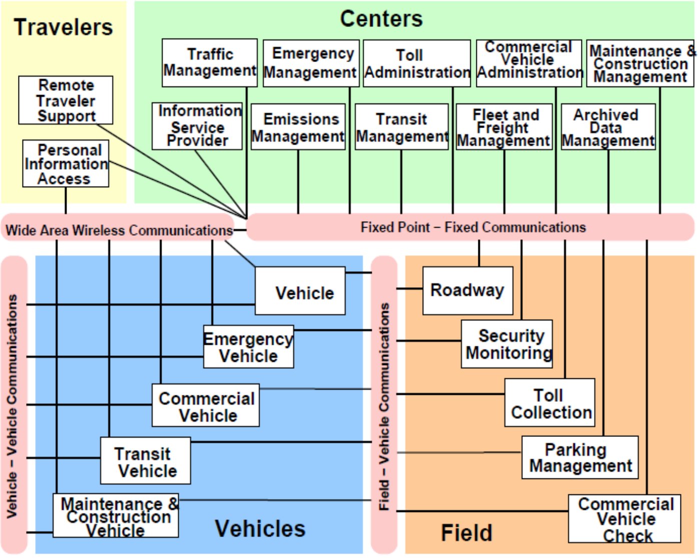

Fig. 7: *ITS physical architecture showing subsystems and communications.*

4. RESULT AND DISCUSSION

In the proposed system, link travel time estimates are a key input for dynamic route guidance systems when a vehicle exits a link, the corresponding travel time will be recorded. Every vehicle can then broadcast its link travel time database to surrounding vehicles at a specific transmission interval. It will be shown how the vehicle adapts the transmission interval according to the traffic environment. When a vehicle receives a packet from another vehicle, it combines the data with its own existing database. Using this method, overall traffic information can spread rapidly among vehicles. The estimated travel time information can then be used by an in-vehicle dynamic route guidance system, which can compute the shortest duration route in real time to help the driver avoid any congestion and/or incidents. The requirement that every vehicle be equipped with onboard integrated device may seem like a deviation from our goal of zero infrastructure design. Now days integrated ITS solution that will enhance the journey experience of public transport users. Providing accurate traffic information is becoming a major challenge for the public institutions and private companies leading to the rapid growth of intelligent transportation system (ITS). At the same time, the emergence of new information technologies and the transformation that has occurred in road traffic management has both increased a need for very accurate road traffic information. In Colombo Municipal Council (CMC) there is some real-time display system in Colombo but there is not on street displays system in this city council area. So that proposed ITS solution will display the real-time on Main Street in Colombo areas. Incorporate with this proposed ITS Architecture solution will help to optimization of trips in this area. Social, economic and environmental factors must also be considered in Colombo Municipal Council (CMC).

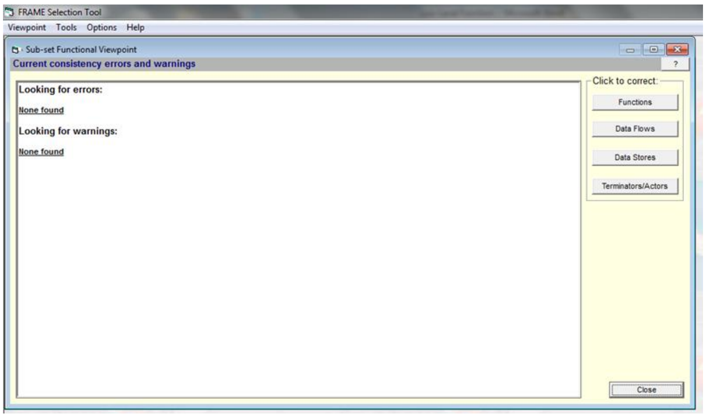

Fig.8: *Intelligent transportation system (ITS) Final stage.*

5. CONCLUSION

Intelligent Transportation System (ITS) to improve safety and making traffic flow, conjunction. This is may increase the number of the journey with Colombo Municipal Council (CMC) area. The Colombo Municipal Council (CMC) is economy will improve through the access. This is the influence of business and residential area which is negative impaction social and environmental. These are the factors consider in Colombo Municipal Council (CMC) for the travel information.

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