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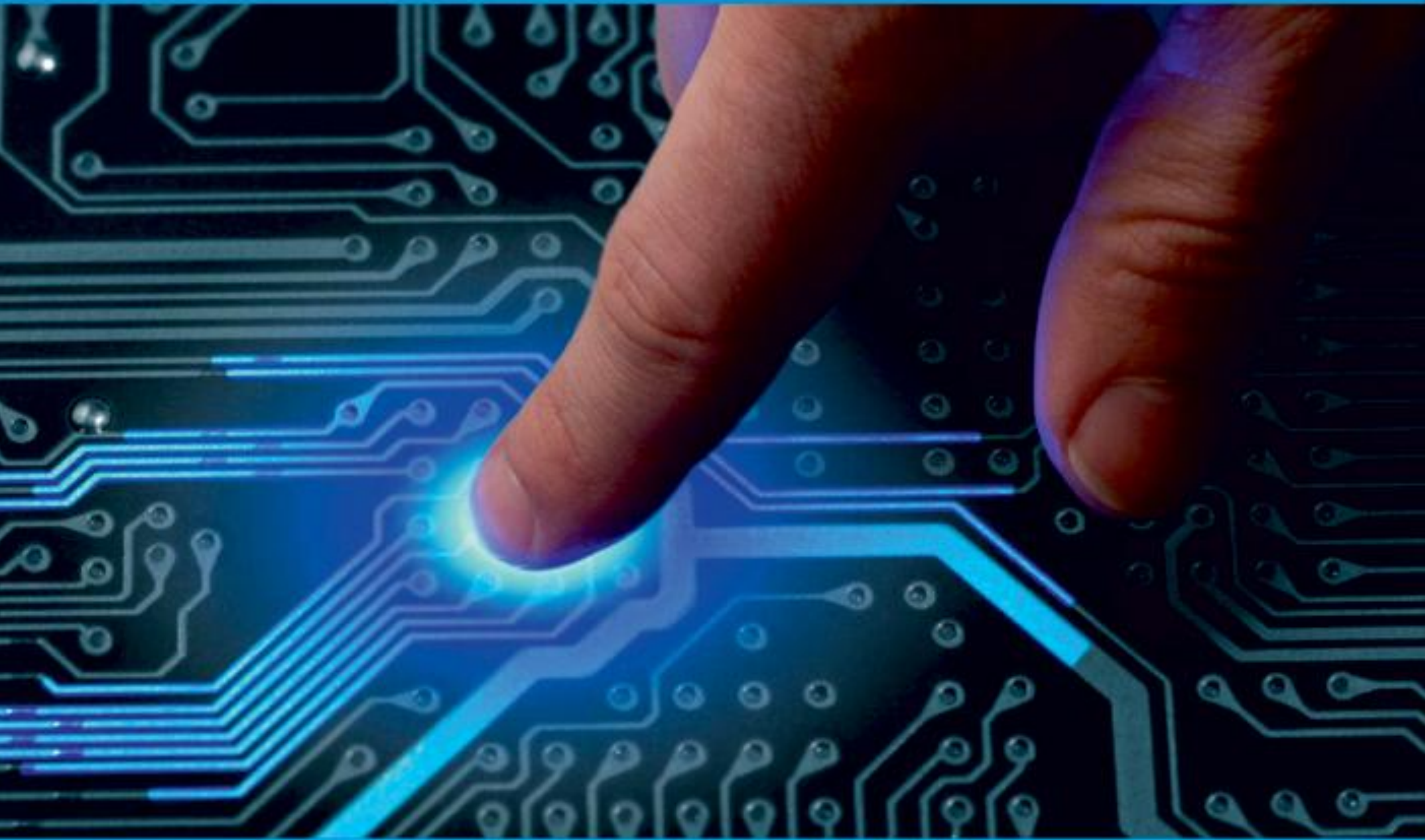

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Vehicle Intelligent Transport System for Preventing Road Accidents Using Blockchain

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ABSTRACT: Road safety is the prevention and protection of human lives from road accidents by implementing road safety measures. Majority of the road accidents are caused due to the careless driving techniques followed by the driver. The presence of speed breakers and steep curves in the road will be inconspicuous in low visibility conditions, like at night, or when there is fog, rain or snow and this will lead to the road accidents. To avoid such accidents certain measures like automatic speed break detection system in vehicle and steep turns or curves detection in the road way using blockchain technology will improve the road safety and saves the human lives being injured and killed unnecessarily.

I. INTRODUCTION

. An objective of the proposed system is to design a system using blockchain for an in-vehicle intelligent transport system.The Intelligent vehicle (IV) is experiencing revolutionary growth in research and industry, but it still suffers from many security vulnerabilities. Traditional securities methods are incapable to provide secure IV data sharing. The major issues in IV data sharing are trust, data accuracy and reliability of data sharing data in the communication channel. Blockchain technology works for the crypto currency, Bit-coin, which is recently used to build trust and reliability in peer-to-peer networks having similar topologies as IV Data sharing. Current ITS system uses ad-hoc networks for Vehicle communication such as DSRC, WAVE, and Cellular Network, which does not guarantee secure data transmission. Currently, vehicle communication application security protocols are based on cellular and IT standard security mechanism which are not up-to-date and suitable for ITS applications. Still many researchers are working to provide standard security mechanism for ITS.

II. LITERATURE REVIEW

In [1], Dhananjay Singh et al specified, connected vehicle architecture solutions for both safe and smart driving in personal/public vehicles. The idea is to utilize Internet of vehicle's dashboard camera (Smart-Eye) to enhance the control and accident prevention/monitoring services. The smart-Eye has capability to capture and share their real-time accident/traffic footage into text, audio and video forms to the related authorities such as nearest vehicles, police staff, hospital, family members and insurance company instantly along with the location. Hence, the Smart-Eye solutions can support automotive markets for smart and safe driving.

In [2], Marko Dragojević et al presented a design where existing IoT technology is utilized to enhance automotive middleware (Adaptive AUTOSAR) and enable remote monitoring and diagnostics services for vehicles. This way we give indication of feasibility of today's IoT in automotive context.

Paper [3] "Adoption Of Iot In Automobiles For Driver's Safety: Key Considerations And Major Challenges", reviewed the existing literature and technologies in implementing Smart Vehicle Monitoring System (SVMS) to reduce emergencies and accidents caused by health related issues. It thoroughly evaluates IoT based infrastructural components needed for

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deploying SVMS in vehicles. This research also focuses on the key considerations and major challenges in executing health detecting IoT based steering wheel system into a car.

In [4], Abd-Elhamid M. Taha introduced a novel, cost-effective Internet of Tings (IoT) architecture that facilitates the realization of a robust and dynamic computational core in assessing the safety of a road network and its elements. In doing so, we introduce a new, meaningful, and scalable metric for assessing road safety. We also showcase the use of machine learning in the design of the metric computation core through a novel application of Hidden Markov Models (HMMs). Finally, the impact of the proposed architecture is demonstrated through an application to safety-based route planning.

In [5], Omprakash et al further extended with some automatic transport system to provide road safety and more fast results the act upon the environment changes and also to safe guard the human lives. Table 2.1 discusses methodology, advantages briefly.

In [6], a comprehensive framework of IoV is presented with emphasis on layered architecture, protocol stack, network model, challenges and future aspects. Specifically, following the background on evolution of VANETs and motivation on IoV, an overview of IoV is presented as heterogeneous vehicular networks. The IoV includes five types of vehicular communications; namely, Vehicle-to-Vehicle, Vehicle-to-Roadside, Vehicle-toInfrastructure of cellular networks, Vehicle-to-Personal devices and Vehicle-to-Sensors. A five layered architecture of IoV is proposed considering functionalities and representations of each layer. A protocol stack for the layered architecture is structured considering management, operational and security planes. A network model of IoV is proposed based on the three network elements including cloud, connection and client. The benefits of the design and development of IoV are highlighted by performing a qualitative comparison between IoV and VANETs. Finally, the challenges ahead for realizing IoV are discussed and future aspects of IoV are envisioned.

In [7], the ethical implications of SIoV systems are highlighted. Vehicle to Vehicle (V2V) and Vehicle to Infrastructure (V2I) involves autonomous decision making that requires setting ethical and moral rules before taking verdict. The article discusses the lack of ethical guidelines in designing and deploying of SIoV systems that are of utmost importance. Finally, an addition to SIoV architecture is proposed to incorporate the ethical and moral principles for scheming the SIoV systems.

In [8], author claims that the Vehicular Cloud, the equivalent of Internet Cloud for vehicles, will be the core system environment that makes the evolution possible and that the autonomous driving will be the major beneficiary in the cloud architecture.

In [9], Lindros et al surveyed the key concepts of the Social Internet of Vehicles (SIoV), a new type of network that enables social interactions between vehicles, drivers and passengers in the Internet of Vehicles. More specifically, we reviewed enabling technologies and key components of the SIoV and presented context-aware SIoV applications that can be deployed in a smart city. Three main components were introduced that include next-generation vehicles, vehicle context-awareness and SIoV context-awareness applications. Context-aware systems allow vehicles to adapt their behaviour as per the contextual information gathered from different subsystems, such as sensing, reasoning and acting. Several context-aware frameworks are available that support high-level context-aware applications design. Future work should enhance the context-aware systems by adapting existing frameworks and incorporating context-aware applications from different vendors.

In [10], a dynamic methodology has been proposed in most effective way to handle the issue of vehicle crash and location by utilizing the idea of Internet of things. Internet of thing based smart internet of vehicle system finds solution for vehicle safety and ease the work for automobile forensic studies by providing vital data. This research paper is intended to suggest a much effective way of traffic management & in making safety while travelling for everybody.

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III. SYSTEM ARCHITECTURE

With the help of cryptographic hash functions, every block is linked to both its preceding and succeeding block. This essentially results in a chain-like connection where all blocks are securely connected to one another (as shown in figure below).

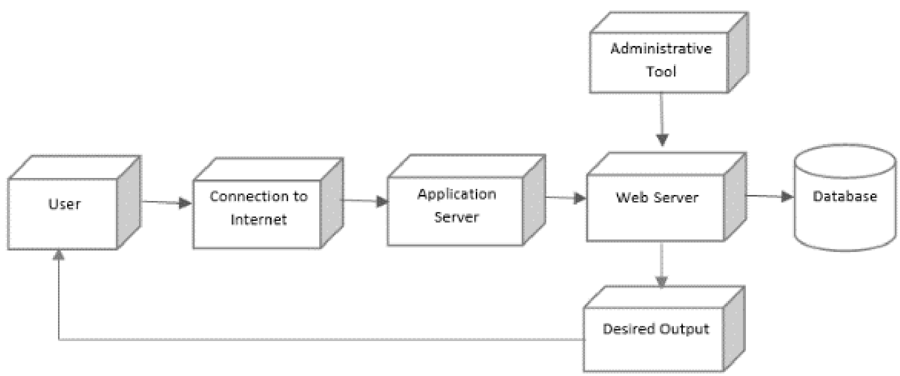

Fig.1. system architecture

System architecture consists of the user interface, web server, database, administration tools and the application server. The user should be connected to internet which will connect him with the application server and then to the web server. The web server will take input as the database, administrative tools and will provide user the with the necessary functionalities.

Blockchain technology is distributed, open ledger, saved by each node in the network, which is self-maintained by each node. It provides peer-to-peer network without the interference of the third party. The blockchain integrity is based on strong cryptography that validates and chain blocks together on transactions, making it nearly impossible to tamper with any individual transaction without being detected.

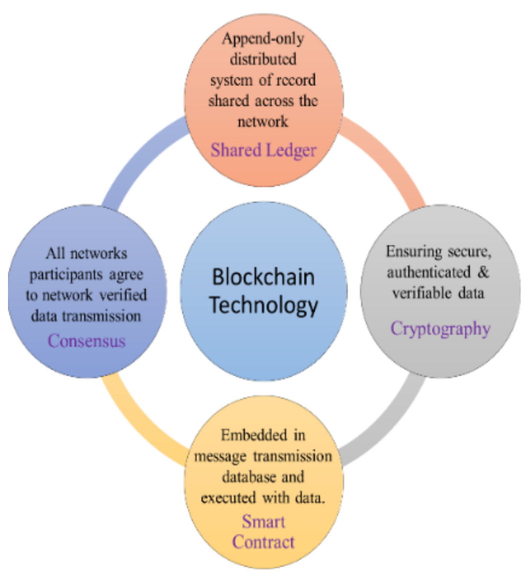

Fig.2. Blockchain technology

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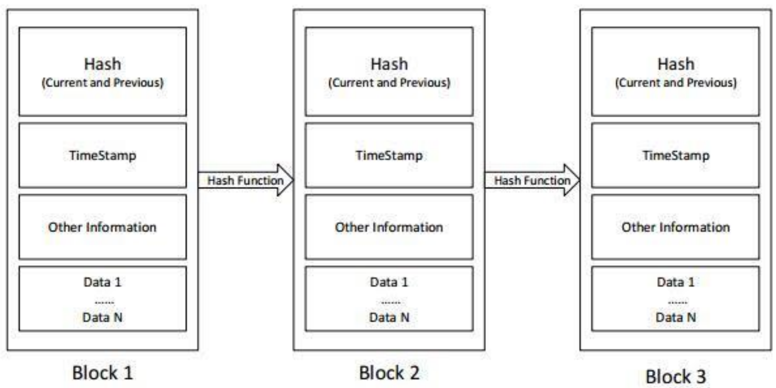
At its core, the blockchain is a distributed, immutable database, able to confirm exactly when and by whom a given transaction has been made. However, its underlying technologies (peer-to-peer networks, cryptography, and game theory) have been around for years, and the blockchain is a rather new way of effectively combining the three. After a certain amount of individual transactions have been conducted within the network, these transactions ("Data 1–Data N") are being summarized in a block and subsequently added to the blockchain. With the help of cryptographic hash functions, every block is linked to both its preceding and succeeding block. This essentially results in a chain-like connection where all blocks are securely connected to one another.



Bitcoin Algorithm: SHA-256

Founded by a pseudonymous individual or group, Bitcoin is a peer-to-peer digital currency that is designed to serve as a medium of exchange for the purchase of goods and services. With Bitcoin, individuals are able to execute cross-border digital payments at virtually no cost, all without having to involve any financial intermediaries. Bitcoin is underpinned by a piece of technology known as the blockchain, which can be thought of as a ledger that keeps a transparent and immutable record of economic transactions that are made using Bitcoin. A significant element of Bitcoin that facilitates its operation is the Bitcoin algorithm for proof of work mining, which is known as Secure Hash Algorithm 256 (SHA-256).

Proof of work mining is an essential component of the Bitcoin system that enables for the correct processing of transactions on the blockchain. The mining element of the proof of work process concerns individuals (who are known as miners), generating correct proofs that are necessary before a block can be added to the blockchain. Miners will use data from a block header as an input, and put it through a cryptographic hash function. In the case of Bitcoin, this hashing function is SHA-256.

Miners will also include a nonce in the input so that they can hash slight variations of the input data. The purpose of proof of work mining is to get a hash value that is lower than the target hash that has been set by the network. If the correct output hash value is found by a miner, they will be able to process transactions and add a new block to the blockchain. Miners are also rewarded in bitcoins for successfully finding a valid hash. It is also important to note that producing a correct hash value in Bitcoin's proof of work system is probabilistically low, thus, a miner will typically need to generate a large number of incorrect hashes before a valid hash is found.

Bitcoin Algorithm: SHA-256

Individuals that wish to mine on the Bitcoin network must operate what is known as a mining node, which is a node that has been specially set up to mine on the network. Once a mining node is operational, miners can then begin to construct what are known as candidate blocks. These blocks must be properly constructed by a miner, and doing so requires that 6 parameters which are found in each candidate block be filled in correctly. These parameters include:

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- **Version** – The version number of the Bitcoin software.
- **Previous block hash** – A reference to the hash of the previous block that was included on the blockchain.
- **Merkle Root** – A representative hash of all transactions that are included in the candidate block.
- **Timestamp** – A piece of information that references the time that the block was created.
- **Target** – The target hash threshold, this block's header hash must be less than or equal to the target hash that has been set by the network.
- **Nonce** – The variable that is used in the proof of work mining process.

The candidate block is then relayed to the rest of the network so that it can be checked for its validity. If the block is regarded as valid by the rest of the network, then it will be added to the blockchain.

IV. CONCLUSION

In this paper, we presented a reputation system used in Intelligent Transportation System where privacy-preserving is our main concern. The Intelligent Transport System technologies like speed break detection, people identification and steep curve detections are implemented the vehicle to prevent the road accidents and avoids the damage of the vehicle. By detecting these and intimating to vehicle users will also improve the road safety.

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