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BlockChain based Secure Smart Property Registration Management System and Smart Property Cards

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Abstract: ***Land is an immovable unique property, its value depends on its location and to prove the ownership of the land, one must provide various legal documents that should conclusively prove it. Due to this reason a land administration and ownership title registration system should be highly secure to avoid any document forgery. The current real estate registration process take a long time to update in the centralized databases maintained in the government registration department, other departments related to the properties which creates numerous property ownership title disputes. The process of storing the land transaction records on centralized storage servers is vulnerable for the hackers to tamper the records to make duplicate, modify and forge the original transactions and also maintaining the ownership title i.e sale deed in the paper documents may lead to missing, damage of documents and also due to human errors it may contain improper, incomplete details related to the property. This paper proposes a system called the Blockchain based Secure Smart Property Registration Management System (SSPRMS) which provides a solution of tamper free, permanent storage of real estate transaction information records on the decentralized distributed public digital ledgers called hyper ledgers. The SSPRMS provides secure, instant the transfer of ownership title without the help of third party, with zero transaction cost using Smart Contracts, implemented based on PoW consensus algorithms, also providing the self-notarization mechanism, and availability of evidence for the land title from distributed databases and a Smart Property Cards (SPC) provides a mechanism for storing updated owner ship title and other details of the property in the digitized form on the digital smart cards instead of storing these information in the paper documents which eradicate the property related disputes, the fraudulent, illegal registrations of property ownership titles.***

Keywords: **Hyper Ledger, Smart Contracts, Distributed, Decentralized, Block chain, Consensus Algorithms**.

I. INTRODUCTION

Blockchain is a distributed public electronic ledger of digital transaction records which are hashed cryptographically and controlled through a distributed or shared network. Blockchain is distributed among millions of computers with mechanisms for validating transactions that utilize a group consensus protocol. block chain is a data structure that makes it possible to create an encrypted distributed shared digital ledger of transactions in the cloud network with identical copies maintained on each of the network's computers. A copy of a shared ledger is saved on every computer connected to a block chain peer to peer network. This "distributed digital ledger" is a reorganization of how information is typically stored, providing a transparency, audit ability, and security. Since all users have an identical database it ensures that a single user is unable to change the data. The distributed network of the blockchain records a public history of transactions. It maintains a secure source of proof that the transaction occurred. Blockchain maintains the histories of transactions in the form of digital data with time stamped and hash value of previous block and connection to the next block in the block chain. Blockchain uses SHA-256 algorithm to allow each participant on the cloud network to manipulate the digital ledger in a secure way without the need for a central authority. The complex cryptographic computation functions applied into the blockchain reduces the possibility of external unauthorized persons to modify previously recorded transaction records.

A. Properties of Blockchain

1) *Peer to Peer, Decentralized*: Blockchain enables peer-to-peer transactions across parties that are unknown to each other. Peers in the Blockchain can transact through an automated programme that guarantees correct transactions. a blockchain is stored in a file that can be accessed and copied by any node on the network. This creates decentralization.
2) *Greater Transparency*: block chain is a type of distributed ledger, contains full transaction history, since the ledger is an open file, any party can access it and audit transactions. By using this property lifetimes can be tracked. All the network

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participants have the same shared copy of documentation. To update the shared copy a consensus between everyone must be established, data stored on a blockchain is more accurate, consistent and transparent. Because if you try make changes in a single transaction record would require the alteration of all subsequent records and the collusion of the entire network

3) *Secure Transactions*: Transactions on the Blockchain take place between parties verified and authenticated through cryptographically-secured keys, and digital signatures. Further, transactions are approved and authorized by a tested democratic process known as '*Consensus Mechanism*'. that Transaction must be agreed upon before they are recorded. Once a transaction is approved, immediately it is encrypted by using secured keys and linked to the previous transaction. This, along with the fact that information is stored across a network of computers instead of on a single server, makes it very difficult for hackers to compromise the transaction data.
4) *Trust between transacting parties without intermediaries:* Blockchain performs secure, trusted transactions without the help of any intermediate middle-man through smart contracts, which increasing execution speed and reducing transaction costs.
5) *Immutable*: A blockchain is a permanent tamper-proof record of transactions. Once a block is added in the block chain it cannot be altered. This creates trust in the transaction record. It is also available to all participants who have permission access. No participant can modified a transaction after it has been recorded on the ledger .To change a single transaction record would require the alteration of all subsequent records and the collusion of the entire network
6) *Increased efficiency and speed*: Since a single digital ledger is shared among participants, everyone has access to the same information; it becomes easier to trust each other without the need for numerous intermediaries. Thus, efficient clearing and settlement of property can occur much quicker.
7) *Auditability*: The data in blockchain is stored in the form of hashes and Merkle roots of sets of data. In case any data is changed, the hash of the data, and that of the overall set of data (stored in the form of a Merkle root or combined hash of hashes) changes. Hence, blockchain can be used to audit data to throw out any unapproved tampering.
8) *Digital proof of Document*: Blockchain deals with digital identities of assets, their owners, and the transactions that result in their respective state, like change of ownership etc. All these are programmatically carried out through atomized processes resulting in paperless transactions.

II. DIGITAL LAND REGISTRATION PROCESS

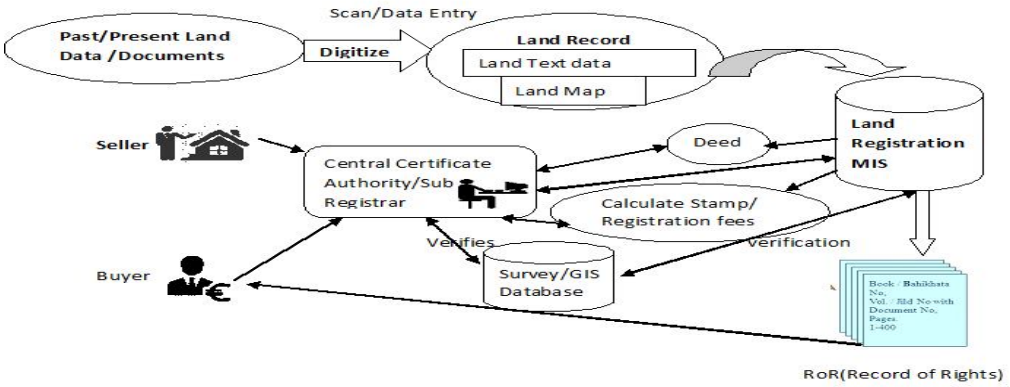


Fig 1. Digital Property Registration Process

Land or property Registration refers to the Registration of the document, changes in ownership and other transactions involving immovable property. Whenever a buyer purchase an immovable property, it is imperative to get registered to concerned authority to ensure legal ownership and a title guaranteed.
This helps in reducing the risks related to frauds and maintenance of an up-to-date record.
The land or property registration process has shown in the above Fig.1. have the following steps

1) Both the seller and the buyer can have a verbal agreement over the purchase or sale of land. Once contract is verbally agreed upon, it is need to record on paper as well (sale document).
2) Once the deed is made; it is required buy non-judicial stamp papers of that value arrived at after the calculation.

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3) The stamp papers can be purchased in person or online. We can buy these papers from licensed stamp vendors, whereas e-stamps can be purchased online and stamp duty has to be paid.
4) Now, the deed has to be prepared and typed on stamp papers. Based on the nature of the transaction the subject matter differs.(sale, lease, mortgage, power of attorney, etc).
5) Now, the stakeholders have go to the Sub-Registrar's office for registering the deed, along with two witnesses and with their respective photographs, identification documents,etc. An original copy of the deed, along with two photocopies of the same, should also be carried.
6) Now it is responsibility of the sub-registrar to verify originality of the document produced by parties, he verifies the records of sub registrar's office to ensure the current ownership of the property encumbrance certificate, property tax paid receipts, any legal issues pending, mortgage documents, khata certificate, stamp duty, government value, classification of land, and land use certificates to register sale deed.
7) After the sale deed gets registered, the parties get a receipt. After some weeks, one can again approach the Sub-Registrar's Office to collect the sale deed.
8) Once the buyer got the original sale deed registered, he can also get the same verified by using the registry details and date from the Registrar's Office.
9) The final step is to get the mutation of the property done in the land and revenue records.

A. The Need of Blockchain in Property Ownership Title Registration Process.

In real estate the ownership of the land or property determined by accessing to a land title, which protect the right of the title –holder. The land or property ownership is also determined by various records, such as registered sale deeds, property tax documents, government survey records, Khasra, khattuni, Sharja and Parwan, which are maintained by different government departments and also not digitized properly. Due to the poor maintenance and less transparency, these records could be mutated without the consent of owner. Also the real estate transactions involves a high value property title transfer, so it is important that to have accurate records which identify the current owner and provide a proof that he is indeed the owner to protect owners' rights (in case of theft or missing) resolve disputes make sure ownership is correctly transferred to a new owner after sale prevents sale fraud. A registered sale deed is not government guarantee of land ownership. Thus it is crucial to maintain correctness and completeness of this information in secure decentralized storage to prevent unauthorized, fraudulent changes. A government registration department is responsible for keeping track of ownership information. But these records are not preserved in a systematic way and stored in centralized databases, which are not updated properly and the change of ownership title simultaneously not reflected in the various records maintained by different departments.

The property title transfer is bureaucratic, expensive, and time-consuming, does not provide transparency in the process.The lack of transparency has caused data in real estate to become very valuable, in efficient (asymmetric information). Since there is no global standard or public ledger where all the data is registered, there is a need for third parties to verify the data more than once.

The concept of a transparent, decentralized public ledger in blockchain could be applicable to land information management, where the land registry serves as a database of all property rights and historical transactions. In addition to the previously established added levels of security, auditability, and transparency that blockchain technology provides, a blockchain land registry would be less vulnerable to malicious record destruction attacks and natural disasters. This paper proposes a Blockchain based solution to bring transparency in property title transfer process, enhance the coordination across department with block chain, and to maintain the integrity of records of right to prevent the insider attack and incorporate the traceability. The Blockchain based system provides a uniform trusted source of real estate information for the various stakeholders, auditors, banks, financial authorities, appraisers, owners and avoid the unnecessary multiple verifications of the same data, which reduces brokerage, legal, recording and bank costs.

It also permits any two parties to transact directly with each other without the need for a trusted third party or central authority. Block chain is an innovation that enables all data pertaining to a property or owner to be easily verified and accessed by a buyer, seller, and trusted third parties. It enables real-time settlement of recorded transactions, removing friction, reducing risk, and legally recognizing the authenticity of digital proofs of ownership. Also it could bring all the land records under one system, and at the same time maintain its integrity. Once title transfer process is done using blockchain all the land records are updated simultaneously, which are maintained by the different departments.

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B. Blockchain Architecture

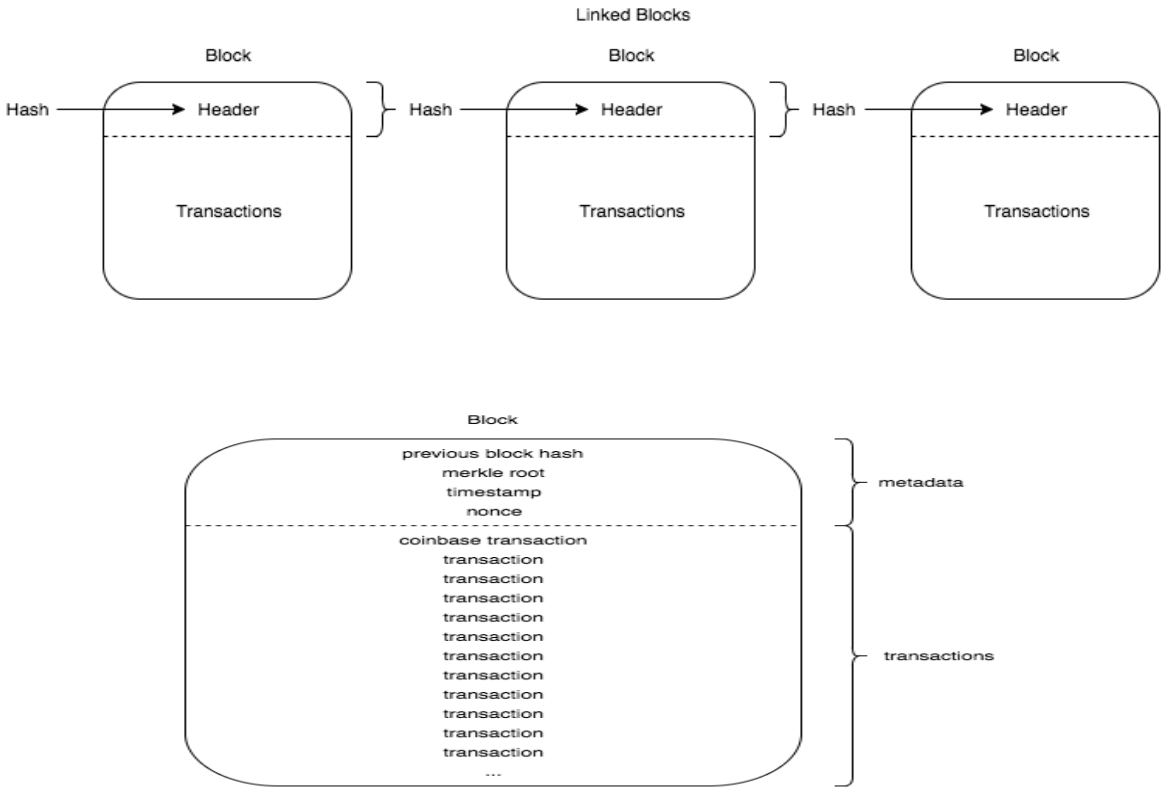


Fig. 3: Block Structure

Blockchain is a sequence of blocks, which holds a complete list of transaction records like conventional public ledger Figure.2 illustrates an example of a blockchain, with a previous block hash contained in the block header. The first block of a blockchain is called genesis block or parent block.Blockchain structure consists of three main core parts namely block, a hash algorithm for linking the block chain and the decentralized distributed cloud network. Block comprises the list of transaction stored over a particular period with time stamp values. The block chain maintains the histories of transactions in the form of digital data with time stamped and hash value of previous block and connection to the next block in the block chain.

1) *Block***:** Block has two components viz. block header and and the block body contains list of transactions as shown in Figure 3. The block header consists of previous block hash, mining statistics used to construct the block, a time stamp and Merkle tree root. Every block inherits from the previous block i.e. previous block hash is used to create the new block hash and make the blockchain tamper proof. The transactions are organized in a Merkle tree structure. It is used to verify the all transaction and construct the block hash. If there is any change in the transaction, all the subsequent block hash will be changed. Blocks are connected using hashing function which is termed as chaining. Hash function is one of the strongest mechanisms it cannot be decrypted at any cost.
2) *SHA-256 Hash Algorithm:* A cryptographic hash is an algorithm that takes an input of random size and produces an output of a fixed size. Any amount of data can be used as input to a hash function, and the output will be a hash that can be used as a digital fingerprint to uniquely represent that set of data. The output will always be the same for any identical set of data. Blockchain technology uses double (Secure Hash Algorithm) SHA-256 to make the blocks unaltered. In SHA-256 algorithm it is possible for anyone to use a hash function to produce an output when given an input; however, it is impossible to use the output of the hash function to reconstruct it's given input. The system which has high processing power, operates a node is called as Miner. In order for a miner to produce the previous block hash parameter, the block header of the previous block must be put through the SHA-256 algorithm twice. Miner receives the reward in the form of crypto currencies for their service and also to produce the merkle root a SHA-256 algorithm can be used, which is then subsequently inserted into the block header.

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3) *Merkle Tree***:** Merkle tree is data structure where each non-leaf node is a hash of its respective child nodes. The root hash can be used as the fingerprint for an entire data set, including an entire database or representing the entire state of a blockchain. In property ownership title registration system the certificate authority generates and distributes respective certificates to all departments, documents are uploaded in the blocks and, their hash is generated and a Merkle tree is generated using the hash of documents. Root hash is stored in a blockchain along with timestamps and tokens are generated.
4) *Distributed Digital Ledger: The* distributed ledger technology (DLT) used in block chain as a secure and transparent way to digitally track the ownership of assets eliminates the transaction costs, information asymmetry and reduces the risk of fraud, double spending, abuse, and manipulation of transactions. The blockchain is so unique that all the users or nodes on the network have a partial or complete copy of the transaction history stored on the distributed ledger on the block chain. The block chain data has numerous copies on systems throughout the network making is impossible for hackers to edit each and every record in the ledger to make the change in data completely untraceable. Each and every piece of information about the transaction has been recorded in the public distributed digital ledger, and it is distributed over the network of participants. Public distributed digital ledger maintains the high degree of consistency so that the recorded fact remains unaltered at any cost.
5) Smart Contracts: Smart contracts are a kind of an agreement or contract that implements the self-executing, programmed computer code which can be completed without any human interaction. Once programmed, smart contracts are not taken control of central authority. It helps us to exchange shares, property and money by avoiding a service of third party. In smart contracts a person can exchange anything of value, any legal binding contract using a transparent process which is executed only when the conditions of the contract are met and all this without the services of a middle man. It has three core elements a rate of recurrence to test conditions, a group of conditions and an action that gets activated by those conditions. The smart contracts become immutable, self-executing parts of program meeting on a transparent and auditable public ledger. By the use of Smart contracts we pay in the form of bit coins into the ledger and the concerned share or property are exchanged.
6) *Digital Signatures***:** Blockchain technology uses Public key Cryptography to ensure each party in a transaction that they are the legitimate owner who has access to spend or sell their assets, uses digital keys to protect data. Each person is issued two keys, the public key, and the private key. The public key can be shared with anyone, the private key is kept secret. The private key can be used as input to a function that will encrypt data. Only the twin public key can decrypt that output. The idea is that the seller in a transaction uses their private key to encrypt the transaction data and they add the resulting output cipher text to the transaction as a sort of digital signature. The seller's public key is inserted in the transaction and the buyer uses that key to decrypt the signed transaction. If the buyer is able to decrypt it successfully, the parties can be sure that it was truly the seller who both initiated and authorized the transaction. Each transaction that gets broadcast is digitally signed, and the public key, only the buyer can decrypt signature.
7) *Consensus Algorithm:* Blockchain are decentralized so that consensus protocols required. As Blockchain works on the global scale the proper security need to be ensured and it is achieved through consensus algorithm. Efficiency of the protocols are laid upon three basic features namely, Security (Consistency of the shared state), real time value and fault tolerance (recovery from the failure of node present in consensus). The consensus protocols are differed based upon the Blockchain network. For permission less model three algorithms has been used to achieve the consistency. Initially Proof-of-Work (PoW), secondly Proof-of-Stack (PoS) and Proof-of-Burn (PoB). Proof-of-Work (POW) provides a robust consistency for Blockchain technology.

III.BLOCKCHAIN BASED PROPERTY OWNERSHIP RECORD SYSTEM BASED ON BITCOINS AND SMART CONTRACTS

The use of blockchain in land registration process is primarily being explored for its potential to enable the secure, instant transfer of property. With smart contracts enabling self-execution when certain conditions are met transactions could be completed faster. For example, a rule could be put in place to facilitate the title of a property being automatically transferred to the new owner when they deposit funds to the appropriate account, updating the ledger.

In a property registration process to avoid the trusted third party, consensus is established using the blockchain which keeps records of previous transactions and proof of work(PoW) which makes changing historic records prohibitively costly correctness is guaranteed by protocol rules and the owner of the property can be identified using public key cryptography. The ownership of the property is controlled via the block chain, using smart contracts. This reduces fraud, duplicate registration, brokerage fees.

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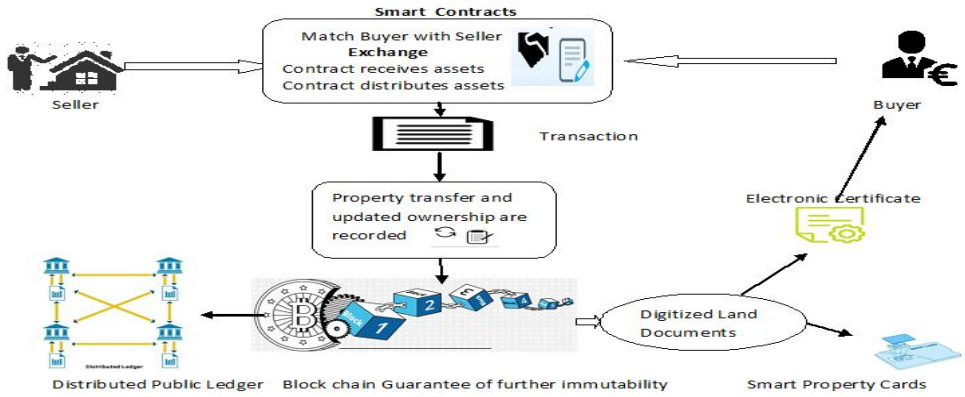


Fig. 4. The Blockchain Based Property Registration Process

The above Fig.4.Illustrates the Blockchain based Property Registration System. The process of transferring the title of the property ownership is as follows,

The property information is stored on the decentralized public ledger, those records and manages the property rights. It enables the secure and fast instant transfer of land property, when the certain conditions are met from the buyer and sellers perspective (Smart Contracts). To start a process of transfer of title of ownership of the property registered in smart property database, first both the buyer and seller must register to the permissioned Blockchain network with their identity. The buyer generates a request to send details of property and forwards it to the seller.

The seller once receives the buyer's request and passes it to the land blockchain. Then the Blockchain responds to seller that contains the buyer's request, the lands public key, other details of land (ownership, area, location etc.,) the current owner's public key, and the transaction details of the prior ownership transaction. Once the buyer is satisfied with the details provided by blockchain, then the transaction will be initialized and ownership title transfer information will be processed and updated to all users of the block chain network. The above process will be executed as follows, initially bitcoin called a 'genesis transaction output' which represents the initial owner recorded by the system. Once the property is sold or transferred, a transaction output which belongs to the previous owner is spent, and a transaction output which belongs to a new owner is created in the same transaction, which needs to be created according to certain rules and automatically update the ledger simultaneously. The user's allow to access and knows the information about the property, it also provides the automatic assurance about the land property ownership.

If any persons wish to identify an owner, then he has can verify the transaction history starting from the genesis transaction up to an unspent transaction output. The owner of the unspent transaction output is the current owner of the property. Bitcoin blockchain has his Bitcoin address and he is able to prove that he is the owner by signing a message with the private key associated with that address. The transfer history will be securely preserved in the block chain. Blockchain based land registries eliminates the registration gap, reduces the risks involved in frauds, intermediate charges and also block chain based system produces a Smart Property Cards which contains the digitalized form of updated transaction record stored in the block chain hyper ledger, to provide strong digital evidence of ownership title for the property purchased by the buyer.

A. Coloured coin based Property Title Transfer

Another alternative method in blockchain uses Coloured coins" concept to represent a specific asset Colored coins" are used, by "coloring" a token in a blockchain. It can be exchanged on the Bitcoin blockchain, like Bitcoin, by creating a decentralized system of asset management that uses the blockchain as its ledger. Coloured coins enable a user to determine and attribute value of an asset into a token for exchange or distribution. For example, a token can be coloured to represent ownership of a single property, with regard to land administration, property title can be attributed to a token – which can include public registry details such as size measurements, GPS location coordinates, year of purchase or built, etc. – and the exchange of the token can be tracked every time it changes hands through a series of transaction outputs. When a property is first associated with a coin, it creates a "genesis transaction" i.e initial owner recorded by the system. When the property is sold or transferred, the transaction output belonging to

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the previous owner is "spent" and, at the same time, a transaction output belonging to the new owner is created. In this case, if someone needs to verify the identify an owner of a property, he can simply go through the transaction history – starting from the genesis transaction and ends with "unspent," transaction output. Also, the current owner is able to verify ownership by "signing a message" with his private key associated with that address on the blockchain. The coloured coins can provide an easy, secure way to register and transfer a property.

The drawback in the coloured coin system is in this method the property ownership is associated with a certain private key, It is also assumed that only one person is in possession of that private key. There is possibility that private key may be lost or stolen.

B. Smart Property Cards

A smart property card is the mirror image of what is there on the ground; it contains details regarding property ownership title, rights, a map, and liabilities, a unique ten digit property identification numbers. Block chain technology stores the latest updated transaction blockchain in the smart cards which uniquely identifies the current ownership title and details of the land and transactions. The various details stored in the smart property cards are property ownership title information, city survey number of the land, location of the property, area of land in square metres, encumbrance and mutation record, details related loan taken by the owner, details of pending litigations and details of property tax paid. This information is used to identify the real owner of the property, which avoids fraud, it can be used in court litigations, it helps holder avoid legal issues in the future. Also some additional information is stored in the smart card, e.g. date of possession and purchase price in digital fields, which reduce the risk of the contract being incorrectly formulated. Signatures are provided in the smart card. The owner can securely retain a copy of the agreement and the verification record in the blockchain in their smart property card. So the contract cannot be lost or falsified. If anyone wants to print out a paper copy, it is easy but it is then just a copy that is only valid for the time when it is taken out. The credit documents can be attached to the smart card and signed directly when the purchasing contract is written up.

The Smart property card is an embedded chip that contains a secure microprocessor, RAM, nonvolatile memory, and a crypto-coprocessor. The memory and processors are protected physically, using a variety of software and hardware security technologies. Smart property card system will make property related information easily accessible to government and the owners. The data on the property card can be accessed through in-built QR code.

IV. THE PROPERTY BLOCKCHAIN BASED ON SHA-256 ALGORITHM

Blockchain technology creates a unique verification record of digital files with unique code using fingerprint algorithm called as cryptographic hash. The SHA-256 algorithm takes all of the ones and zeros that describe a digital document and recalculates them in a repeatable but irreversible way. The algorithms take every third digit in the file, multiply the number by 7, and divide the total by every fourth number in the file. Combine every number not used in the previous calculation to the number you have, etc. In the end, a hash is created. If the same digital documents and the same encryption algorithms are used, the result will be the same hash. However, it is not possible to understand what the file looked like that created the hash — it includes just a few characters, for example, 32 numbers and letters. In the same way that a fingerprint is unique, the hash is unique for a digital file. But if you look at a fingerprint, you do not know what the person looks like, and in the same way a person looking at the hash does not know what the digital file looks like. A sale deed document for a property transaction that is scanned and becomes digital and unique hash created from the document. For example, the buyer wants to apply for bank loan for the property which he is intend to purchase, then he collect the property card from the seller and submit to the bank. If a bank receives a digital ownership document in the property card, the bank can verify that the document is correct. The bank takes the retrieves the document from property card and executes the SHA-256 algorithm on the document. Then the bank can compare the newly computed hash with the hash that is stored in the list of verification records, assuming that it is available to the bank. The bank can then trust that the document really is the original ownership document. If someone gives an incorrect document, the hash will not match. The verification records the such as owners of the agreements, documents, images, signatures, are stored in the form of hashes in the block chain and also list of verification records distributed to more stakeholders. Due to this high level of redundancy allows multiple people to have access to the verification file, the trust in that document grows and an authenticity is ensured. Blockchain able to manage the large number of verification records/hashes, by saving the hashes as a group in a list called as, a block. Each block with verification records is then distributed to the persons who have access to the blockchain, sometimes even publicly. The person who is in charge of approving which of the transactions should be saved and distributed in a blockchain can do this more easily by grouping the hashes in a block. A Merkle tree can be used to convert multiple hashes into one and therefore to save space in the block. The coloured coins are designed to allow a digital code in a blockchain to represent an asset.

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V. THE ADVANTAGES OF BLOCKCHAIN IN PROPERTY REGISTRATION PROCESS

1) *Smart Contract:* Blockchain uses Smart contracts that enable the exchange of money, property, shares, or anything of value in a transparent, conflict--free way, while avoiding the need for a third party to clear the transaction. More importantly smart contracts are autonomous; once a contract is specified and running, no additional human action is ever needed, the platform automatically enforces the terms of the contract.
2) *Digital Records of Real Estate Assets:* Blockchain can be used for any form of asset registration In real estate the whole lifecycle of a property can be digitalized and transferred on a blockchain. In a blockchain based system where every property has its own digital passport with all the information about this specific asset, such as title registration with recent owners, sales prices, transaction dates, lease contracts, loans, maintenance contracts, and even the origin of the building Materials and their condition recorded digitally. Using blockchain the real estate assets are digitalized by creating a token of a property in which all the information of a property is stored.
3) *Transparent and Fast Transactions:* Transaction of property title transfer is time consuming and expensive. The high cost is due to middlemen such as brokers, government property databases, document writers and appraisers, notary publics. If the real estate transaction achieves to store assets digitally on the blockchain, transactions could be handled on a blockchain in a similar way to how payments between parties are handled using Digital currencies, with a fully--secure, verifiable system, two parties could conduct a transaction immediately, without the need for a trusted third party to verify the transaction. Because the history is easily audited, all parties have confidence in the data being shared, and the time needed to close a transaction could be much shorter. If all the information is easily accessible and updated automatically when an event occurs, this can potentially saves a lot of time and costs during the due diligence phase.
4) *Smart Fund Transfer:* Blockchain uses Crypto currencies i.e. bitcoins. Crypto currency transactions can send money to parties on the network more quickly than traditional transactions. A Crypto currency has no physical form. Crypto currencies are based on the concept of money as information: the money is a string of bits, sent as a message. In property transfer system the buyer can transfer fund to the seller securely by using crypto currencies.

A. *Applications of Blockchain based Property Registration System*

1) *Property Sale:* The property owner wants to sell the property, and then they can check their ownership to verify whether there are any obstacles to the sale by themselves using their Property cards and by verifying their identity with the help of SSPRMS. The property owner, the seller, contacts a real estate agent can easily sell the property.
2) *Bank Loan:* The buyer's bank can provide preliminary approval of the loan so that the agent and the seller can be confident that the Buyer has the ability to pay. The buyer's bank is given access to the property via the Smart Property Cards and the bank can check the information about the condition of the property, inspection report etc. The credit documents accessible only to the buyer and the buyer's bank. The bank gets a digitally signed copy of loan documents directly when the purchasing contract is written. The bank can pay the down payment to the seller directly at the time of signing the contract, because the buyer signs the payment order digitally. This is done with digital signatures and digital identification.
3) *Mortgage Deeds:* In the mortgage deed process the bank can verify the ownership title of the property through smart property cards and can sanction mortgage loan against the property. The mortgage loan transaction can be recorded on the blockchain and smart property card.
4) *Property Insurance:* the property records are stored on a shared database of blockchain and the information necessary for establishing clear title was readily accessible, trusted among all parties and make property title searches more transparent and these public records can be used by the property insurance companies to effectively calculate the insurance value for the property.

B. *Advantage of Smart Property Cards*

1) *Tamper Proof*: Data stored on the smart card cannot be tampered or altered.

a) *Authenticity*: Bank and financial institution can verify authenticity of document using smart cards before hypothecation of property.

2) *Easy Property tax calculations*: Government property tax authorities can efficiently calculate property tax value based on the information in the property cards.
3) *Durable and Security*: compared to paper based documents (sale deed), the smart property card is made by poly carbonate material, which gives long life and the card stored with encrypted documents.

a) *Accountability:* The documents are stored along with digital signatures to ensure authendication.

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VI. CONCLUSION

Blockchain-based land registry offers a number of clear advantages over conventional centralized database systems.Blockchain, replaces the locally-maintained real estate records as the primary source of property title information. A Blockchain based secure property ownership recording system described in this paper eliminates most potential failures and attacks in property registration process through transparency and use of cryptographic primitives for authentication. Thus it can be used to reduce reliance on trusted third parties, reduce costs and reduce number of fraud and errors in the property registration and in this the process of transferring property title would be optimally efficient and secure and also blockchain based crypto currencies is used to transfer fund securely and digitally from buyer to seller. The smart property card provides an authenticity and uniquely identifies for the ownership title of the property, it reduces property related disputes.

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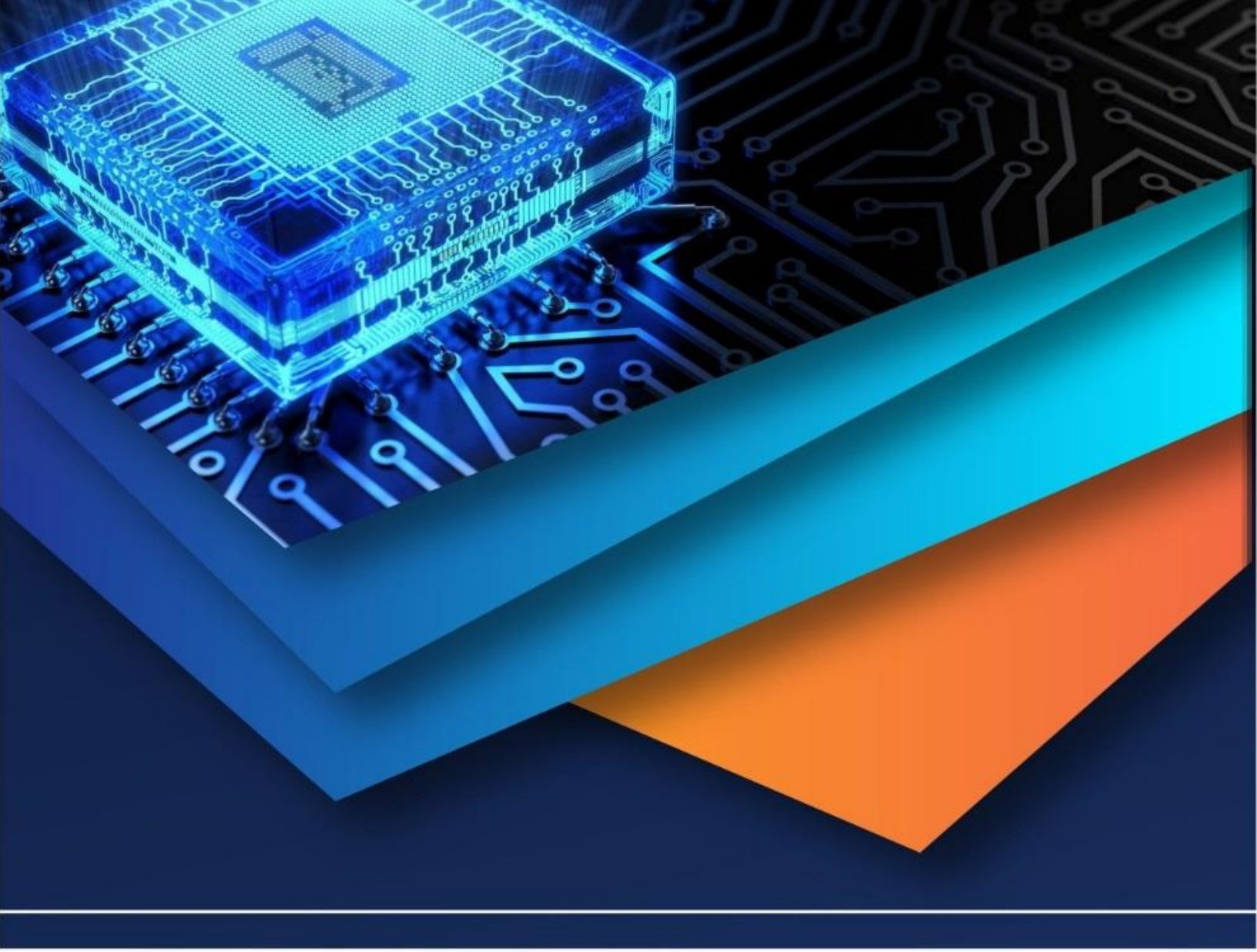
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