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Stem – An IoT Based Solution For Tracking Objects

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Abstract: ***Internet Of things (IoT) is an inter-connected networking ecosystem of physical objects also called as "things" embedded with softwares, sensors, electronics provided with unique IP addresses which are accessible through internet and are capable of collecting and sharing data in a network without the intervention of humans. In this journal the author proposes a neural network guided model to track and find real-time updates of objects which will be tracked and updated bythe means of Radio Frequency Identification (RFID). This will help corporate resources to be handled in an effective way. In order to assist and smoothen the process of tracking and precisely locating any physical object amongst corporate and professional environment through IoT is our idea. We propose a model called as Sensor based Tracking Enabled Model (STEM) that deals with various processes in order to correctly identify, track and locate the essentials and objects used in professional environment.***

Keywords: IoT,RFID,STEM,Objecttracking,realtime,sensors.

I. IoT AND RFID

In this time constraint world, we often battle with ourselves for very small fundamental crucial needs such as finding or locating our own essential belongings and stuffs .With the help of this advancing IoTtechnology, any physical object can be connected to internet which can be tagged and precise location of that object can be tracked and the data can also be used for further processing and analysis due to which it is known as Internet Of Things(IoT).The accurate tracking of real time indoor objects based upon the aggregated binary measurements implemented by particle filtering was proposed which were tagged in Ultra High Frequency (UHF) Radio Frequency Identification (RFID) systems[1]. With the fusion of multiple sensors i.e. two laser sensors and camera sensors a novel scheme for object localization and tracking was presented by researchers [2]. A hybrid RFID and computer vision system for fine-grained localization and tracking of tagged objects called as TagVision along with a fusion algorithm was suggested to organically combine the position information given by the CV subsystem, and phase data output by the RFID subsystem [3].The problem of tracking dynamic objects with UHF RFID tags using a Bayesian framework with a mobile robot was addressed. The two stage dynamic motion model was combined with the dual particle filter in order to capture the dynamic motion of the object and to quickly recover from failures in tracking. And this approach was then tested on a Scitos G5 mobile robot through various experiments [4]. The researchers proposed a novel ubiquitous architecture followed by a protocol for tracking mobile objects in real-time based upon the RFID Tags [5] .An internet based concept incorporated with RFID technology was proposed to form an internet based application for the library management and the RFID reader Motorola MC9090 was used for the entire process which was carried inside the library [6].The way of finding and navigating to an object with an attached ultra-high frequency radio frequency identification (UHF RFID) tag was proposed by the researchers. And the approach was demonstrated using PR2 robot from Willow Garage in a house with a variety of tagged household objects [7]. A hybrid method to achieve high accuracy and efficiency in object tracking which combines Particle Filter with Weighted Centroid Localization (WCL) was proposed and implemented in two real RFID based tracking systems in two applications namely, the wheelchair navigation and LRVs tracking at one of Hong Kong MTR depots [8].In order to serve the purpose of crowd management, tracking of people and location based services during Hajj a method was proposed by integrating different mobile technologies. And a solution was also provided to track the movement of pilgrims via RFID technology [9]. The researchers designed a vehicle anti-theft monitoring system which is based on GPS and GSM technology, cooperating with android software positioning. The designed system is controlled by an RFID module to switch on and off [10].An improved WiFi trilateration-based method for indoor positioning system was proposed by the researchers and the trilateration technique was implemented to determine the position of users and then

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positioning results were further improved using specific reference points [11] . A method to track mobile RFID tag based on measured phase with millimetre level (mm-level) accuracy was proposed by the researchers.

The first-order Taylor seriesexpansion was adopted to calculate the relative displacements of the tracked tag [12]. The design of a working model of a baggage handling system using IoT and RFID Tag was proposed which would track and assist in locating bags. The real time position of the baggage can be tracked and stored in a cloud using IoT and the unique ID can be retrieved by the passengers [13]. A possible security concept for object tracking system was suggested which can be applied on hardware platform by using XOR and PRNG Protocol along with Binary ECC protocol at two different stages without affecting the operational speed . The proposed solution would be useful in secured use of object tracking system based on RFID, GPS and GSM module [14]. A modular and extensible quadrotor architecture and its specific prototyping for automatic tracking applications usingIoT was presented by the researchers. In the designed module basic PID control and a custom target acquisition algorithm was also implemented [15] .A Real-time self-tracking of RFID tagged objects was proposed where the system does not contained RFID readers. A linear observationmodel was also proposed for which Kalman filtering (KF) was the optimal method [16].A RFID enabled graphical deduction model (rfid-GDM) was proposed to track the physical objects [17]. The researchers proposed a Distributed RFID Postal Tracking System for tracing RFID-tagged mails and access it by assigning an IPv6 Mapped EPC address [18]. A secured object tracking protocol based on RFID system for global identification of IoT objects was proposed to enhance the visibility and traceability of objects [19]. Wireless-sensor-network location tracking system based on RFID was implemented using wireless communication technology (WCT), micro-sensors and location tracking algorithm (LTA) [20].

Rationale of Proposed Model

In this fast moving world it is very necessary to run along with it otherwise we may get left behind and in such scenario no one wants to ruin their time in doing irrelevant works which can cause them to stand at last place in this so-called competitive world. And we often waste our precious time in finding and locating our lost objects and stuffs in home or even in workplaces which reduces our rate of performing productive work. In corporate or professional environment executing tasks in deadline is the primary concern and there is no other chance of wasting time in tracing and finding essential objects. So, the purpose of proposing this model for object tracking and precisely locating it is to save a lot of time of professionals which gets wasted in just finding objects and they can focus on performing their tasks on time. Earlier proposed works deals with object tracking andlocation finding but our proposed work not only provides real-time location of objects but also records the information about those objects in neural network enabled database which can be further used for generating a transit report about the movement and usage of objects.

II. PROPOSED METHODOLOGY

The image sensors initially senses the object and searches for RFID Tag, if found then it goes to the next process i.e. RFID Tag acquisition, otherwise if the image sensor detects an object without any RFID Tag then immediately it updates and assigns a new temporary ID to that object. In RFID Tag Acquisition process, the RFID is acquired from the object and then it is matched with the Database which is based on Artificial Neural Network(ANN).The ANN based Database consists of all the data related to the RFID Tagged object which can be further used to generate Transit Reports, later on these Transit Reports can be referred for the analysis of usage of particular objects on everyday basis. But the task of ANN based Database is not limited to this only, it has much more to perform i.e. checking whether the RFID Tag present on the object persists to ours or not. If yes then the last found location of the object is been informed through the Database and finally the GPS coordinates of that object is shared which is the desired output. But if the RFID Tag does not belongs to the tag provided by us then that particular object is been properly observed, updated and details of RFID is been recorded in the database.

The proposed model STEM can be broadly projected into three phases namely –

A) Tracking and Tracing the tagged objects
B) Identifying and updating untagged objects to database and reporting
C) Generating transit report at the end of the day from database

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A) Phase-I Tracking and Tracing

The RFID Tags which already are tagged to objects are acquired using electronic sensors. If a hit arises, then the corresponding object is identified with the help of database and an intrinsic search is enabled with the corresponding RFID Tag to get its previous location likewise all the objects they get a hit and register their current location in database making it easier to track and trace later. The location with respect to corresponding objects are stored in terms of GPS coordinates which the RFID Tag is transmitting.

B) Phase-II Identifying and Updating untagged objects

This phase contains an image acquisition process supported byan image sensor. The untagged or unregistered objects are notified and updated in the database with unique temporary ID which later will be communicated to the admin for necessary action .

C) Phase-III Transit Report Generation

At the end of the day accountability is all what matters. The updated recent relocations of objects and their geographical movements are summarised and a report is generated. The report also contains untagged new objects with unique ID urging the admin to generate a tag.

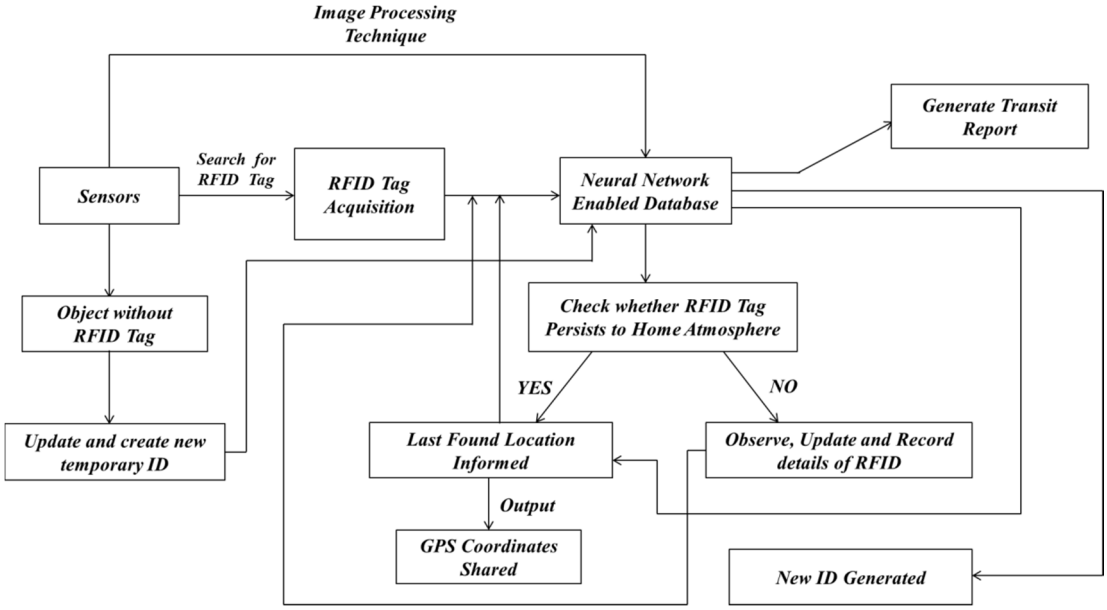


Fig.1 Block diagram of proposed methodology

III. CONCLUSION

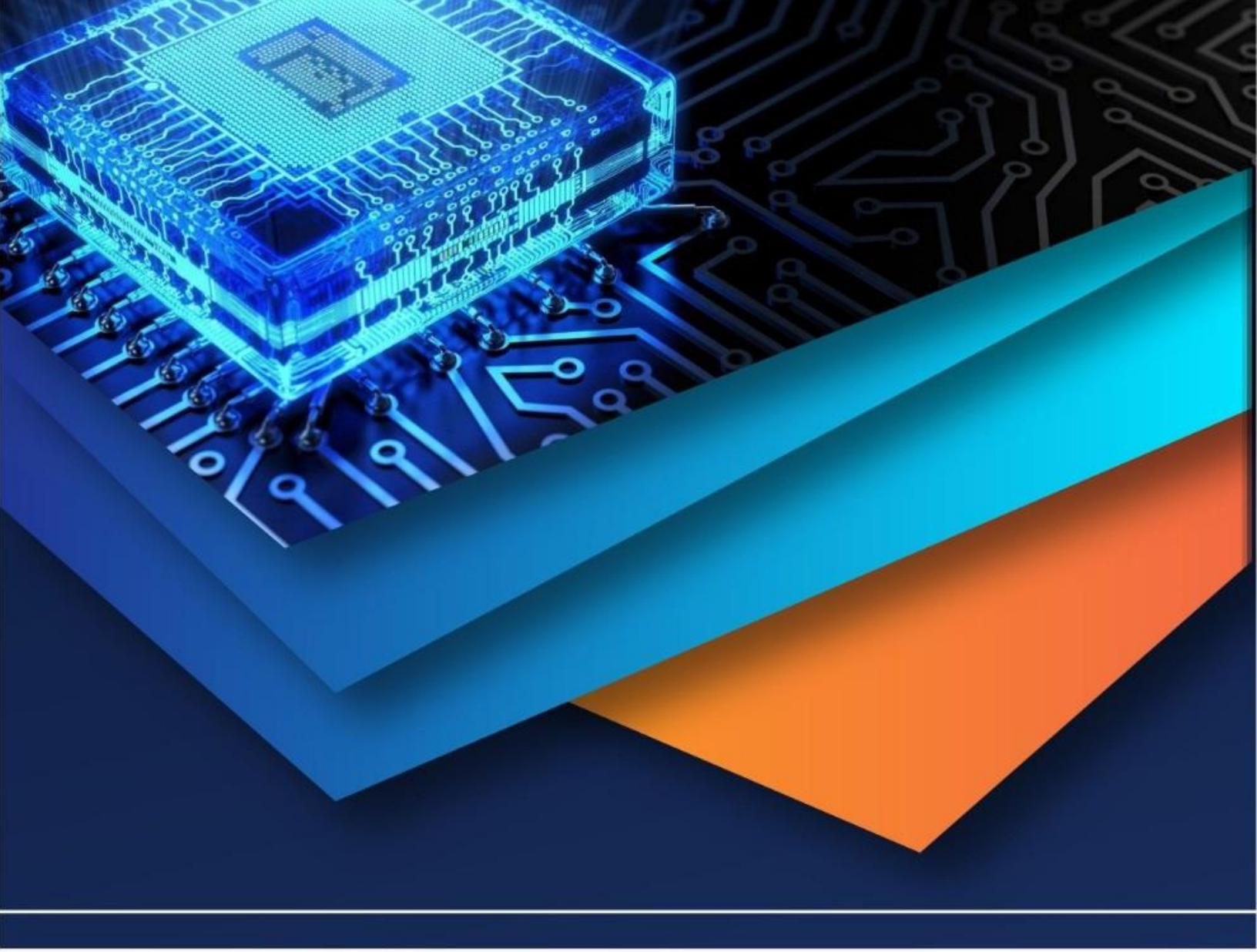
IoTTechnology is not only limited to connecting devices to Internet and exchanging data for communication but has changed the physical things intosmart objectsand with the help of such emerging and advancing technology ,this world can be transformed into a smarter place to live. IoT actually provided us a better and smarter way of using Internet and became a significant key step for the evolution of Internet. Thus the proposedSTEM model is expected to precisely identify, track and locate the physical objects used in professional environment accurately. And this neural network guided model would also provide the real-time updates of the tracked objects using RFID Tag. Accountabiltyis the need of the hour in place where automation still hoping to find an entry.This proposed model will be ensuring that it is carried out with utmost precision,smartness and intelligence.

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