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A Sector Analysis for RFID Implantation: Technical Analysis for Integrated Security Enhancement Techniques

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Abstract: - Radio Frequency Identification (RFID) is a microchip technology which produces a lot of attention of scientists toward innovative and future oriented bionics and a most promising and anticipated technologies in recent years. This interdisciplinary research aims to undertake a scoping study of emerged technology serving the security purposes of devices, infrastructures and human utilization. The study aims to address the key areas of widespread RFID implementation, its control over the applied widgets and the effective improvement in the protection measures like owner tracking and cloning. As a part of research an attempt will be taken toward discussion on security framework to improve the model of smart environment eliminating the privacy loopholes. To enhance the real time security structure the Origins of RFID microchips are essential to be discussed for the application in several sectors like logistics and health care industries. The study will contribute to develop methods and procedures to re-plane the RFID control system, as well as mark other privacy issues which arise in operations when a futuristic society concept is originated where all citizens wear embedded RFID tags and are subject to constant surveillance.

Keywords: Bionics, Implantation, Widgets, Origins of RFID, Control system, Surveillance

I. INTRODUCTION

Radio Frequency Identification (RFID) technology had humble beginnings in WWII in flying industries, Allied airplanes as well as to track nuclear material and in Australia its being in use by veterinary industry (NLIS) at large scale (Tonsor, G.T et al. 2006). Technology then took another jump and currently used in logistics and supply chain management to track the items. Broadly the RFID tags are classified in three categories Active tag, Passive tag and Semi-Passive tags. The ultimate aim of this research is to contribute to the existing technology of RFID, a microchip having the ability to transmit static identity at the short distance: short distance is due to low power of emitting electromagnetic waves. Extensive research has been done to serve the humanity medically with RFID technology. The prosthetic use of microchips can progress scientifically, assist people to hear better, help the handicaps and possibly can facilitate the paralyzed people to move (Charles, Techonal J., Manag, 2008).

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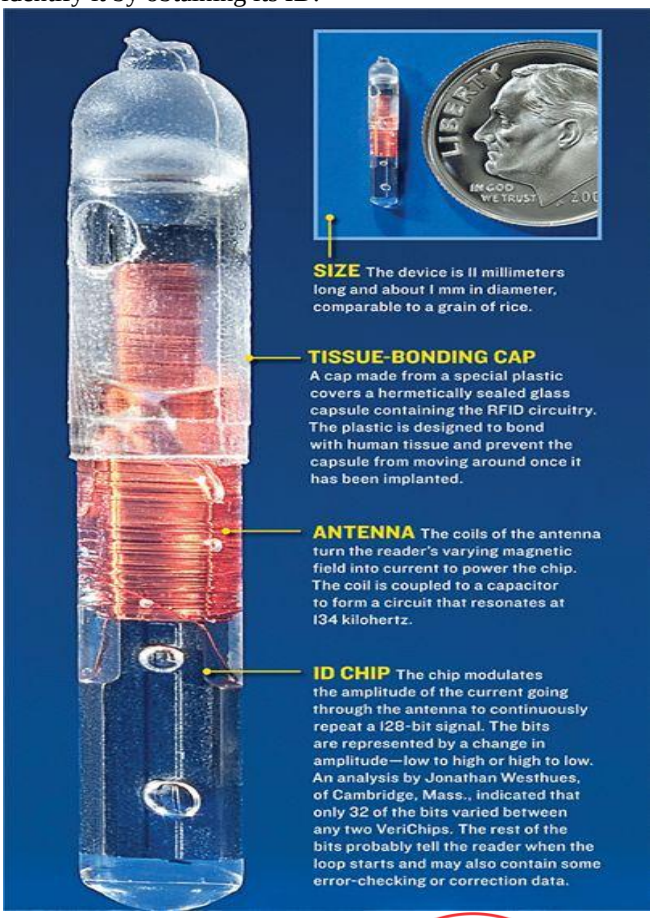
The human embedding microchip technology is available which implant the chips under the controlled application methods though some issues arises in its functional security framework as well as in the control application concerns. The issues include, tracking the person's location at exact coordinates, habitual changes in action at security access point, the privacy concerns as well as the hacking personnel information and access to the secured data illegally. The security problems in the RFID are complex in nature. The undergone research will contribute to steadfast all the significant issue related to the Microchip implementation methodology, its operational measures and all the intensive security issues. An RFID system is basically a tracing and tracking security oriented system, which is proved to be useful for the management of shipments, supply chain and inventory tracking as well. The RFID tags have unique IDs (recorded when installed), are attached to items to be tracked and RFID readers read all the information and identify it by obtaining its ID.



However, pointed out that exploiting RFID systems secures the product and keep track but also lead to some privacy issues. First of all someone may bring out the undisclosed information by getting the IDs of your items. Another one is that someone may follow you by recording the timings and location at which the IDs were obtained. Even it has several safety issues a Japanese investigation firm announces that the number of RFID tags in Japan increase rapidly from 51 million in 2007 to 1.7 billion in 2012 (Yano Research Institute, 2008). The countermeasures against these security reservations along with their resolution have been proposed by many institutions doing research in this domain. Some of them have been implemented in RFID and find some improvements. In this paper the countermeasures of privacy issues pertaining RFID systems are discussed and finally analogizes them from the security point of view. The above diagram is showing Bruce Schneier for security purpose block structure diagram of RFID Chip which is implanted in patients and usually broadcasting details about a heart condition/HIV infection/cancer patient history and other information within range of 20 meters, including the personal identification information which is zero sense from a security and privacy perspective. If the structure is improved and broadcasting is controlled and put into limits then it could control the surveillance and tracking system. There are several types of RFID chips like active, passive and semi passive but active RFIDs is required continuous power source consequently it have the capacity to transmit data without having to be activated by a receiver; they can be linked with embedded sensors to allow continuous monitoring of environmental conditions, applications that interest environmental groups. It generates a huge amount of information accessible through that it may well overwhelm all existing data sources and become from the viewpoint of human time limitations, essentially infinite (Bruce Schneier 20011).

II. LITERATURE REVIEW

Radio Frequency Identification (RFID) technology began in World War II with an "Early Identification Friend (IFF) systems where it was possible for Allied fighters and anti-aircraft systems to distinguish their own returning bombers from aircraft sent by the enemy'' (Garfinkel, S., Holtzman, H. 2005). All along with the benefits of the Micro chipping there are also some potential health problems as well. For example the major effects of radio waves can harm in a dangerous way where Non-lionizing Radiation from microwave radio frequency and magnetic fields can also cause of various health issues (Covacio, S. 2003). Within the medical field there are different ways that RFID can be incorporated. For example RFID chips can be used to track equipment within a hospital. Wristbands with an RFID chip embedded can help hospitals with patient safety requirements. Medical personnel can read the chip to get instant access to the patients' medical history such has medication allergies, medications prescribed and dosage, and specimen results (Castro, L, Wamba, S.F. 2007). One example of the Neuro electronic Interface being used is with a handicapped person named John Nagle. "Nagle showed an ability to perform a number of tasks with his mind: control a TV, move a mouse cursor on a screen and command an artificial hand to open and close grip" (Chan, E. 2007). There are limitations at this time for the Neuro-electronic Interface for RFID chip usage in human. The first is the amount of neurons available for the device. The fewer amounts of neurons there are will result the less likely the device work performance. There is health risks associated with the human being implanted with a microchip. Some health issues include "adverse tissue reaction, migration of implanted transponder, electromagnetic interference, electrical hazards, and magnetic resonance imaging incompatibility". The majority of RFID applications have centered on firms increasing efficiencies in the supplier management process, which ultimately results in lowered costs. However, RFID is also currently being used by logistic service (Chan, E. 2009). Companies in order to enhance the service effectiveness to the customer, thus enhancing the overall value perception. Instead of focusing on efficiencies of supplier relationships for manufacturers, these service firms seek to employ the technology to generate additional value for the customer (Leea, L.S et al. 2008).It will be explore the possibility of developing a generalized framework in human implantation and its privacy matters that can be applied to the design of RFID systems to support co-located collaborations. However, if we find that the said framework formulation will require substantial extension of the research effort, we may decide to leave it open as a future research.

III. PROBLEM STATEMENT

The major challenges arises round the globe regarding RFID (Radio Frequency Identification) technology are its data privacy which results location tracking and harmful for secret information to be snatched. In the same way human embedded microchip is also traced during transmitting data from chip to application database which results to locate the person. These issues provide a strong resistance to the technology and its performance capabilities. In context of these issues the research theme designs the privacy framework and the operational methodology which helps the technology to excel and be applicable within and across the domains diversely with steadfast its performance.

IV. RESEARCH TARGETS

Using the undergone privacy problems in operations, applications and their analysis followings research goals are define with the help of literature.

1- Uncertainty control mechanism occurring in RFID data.
2- How to effectively utilize the RFID for human intensive care purposes? Radical application to respond and transmit data on demand (operational features of Active tags)
3- Implementation of the proposed novel privacy framework for RFID those are the countermeasures to conceal the RFID Tag Existence.
4- How to effectively utilize the time gap when the RFID reader is waiting for the RFID tag to respond to an earlier transmitted command after pre-computation of one or more commands and what technique to apply in such a realistic scenario?

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V. RESEARCH DESIGN & METHODOLOGY

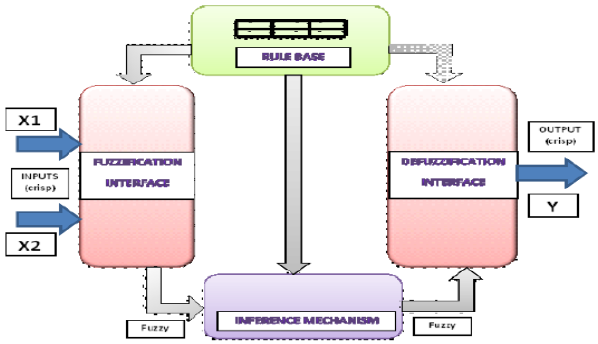
The research process for this study will involve distinct phases. First, an extensive literature review will be carried out within innovation-adoption by the target sector and RFID domain. Based on literature, particularly dealing with organizational adoption, an initial research model will be developed. In the secondary research phase, the tentative privacy framework will be designed based on synthesis of existing research. The indicators of 'uncertainty' (data uncertainty, demand uncertainty, and technology uncertainty) are not necessarily correlated among each other; rather they form the construct (Teo, H.H et al 2003).

1. Uncertainty Control Mechanism Occurred in RFID Data

RFID is predominantly beneficial from customization view point from an automated production line. It is mostly used in industrial robotic, mobile robotics control applications meanwhile the data that it provides is exact and, on the superficial, easy to understand. It is more exact, in terms of classifying objects than, approximately, computer vision, as it can classify which physical case of object is involvement. Machine works in a circle in which each part knows how to perform its duty. This is completely possible with RFID by utilization of the unique single tag number. These tags are stored in the database as a unique key to keep information of unique part. Mobile robot use the RFID to read the tags those are embedded in the floors and walls of the rooms, thus be able to infer its rough location (Lazanas and Latombe, 1992). Although RFID is provides extremely reliable and consistence information about tags. It is very important in RFID technology to read the correct information and interpret the tags correctly. In this technology there is a very vital issue of uncertainty of RFID data that are most near to those problems when using other types of robotic sensors. On the other hand, although existing work on reasoning about the uncertainty in other types of sensor data .It may be doubtful that the object being sense through RFID so full advantage can't be take. Mainly there are two uncertain condition of RFID tag reads that is interpreting the false negative and positive reads. By giving the example of the problem with false negative reads we consider a luggage carousel or conveyor system adhered with tagged shuttles that have tag readers prior to gates in the conveyor that switch the shuttles between different tracks similar to a train switching between tracks by using railway terminals. If a tagged shuttle on a conveyor pass through the tag reader but could not sensed (as an example of a false negative), this activity means that the subsequent conveyor gate could not switched aright. It may be the worst case of overwhelming negligence by the system or the system communicators therefore it may cause jamming the conveyor as the control system is not aware of the shuttle presence. False positive reads have same consequences for automated and wireless controllers, where two lines of conveyor track run closely in parallel, a shuttle might seem to "bounce tracks" if a tag reader intended to sense shuttles on one track reads tags from a shuttle that is on the other track. Once more, this may make the behavior of the control system to be unpredictable; however the main driver is in the RFID sensor information and the data illumination. In the following research endeavors, the filtering mechanisms are adopted probe with the affirmed problems. Although these mechanisms are somewhat ad hoc, we provide the following rules of thumb for solving the problems more generally. The first rule is that, where it can be expected that tagged objects mostly sit statically in range of the reader, and then they should only be considered to be not present when no read has occurred for some period of time. This period of time must be adjusted to compromise between responsiveness and the reliability of the resulting control system. Note that it may be indispensable to adjust the environment so protests do sit in read extend for some period to guarantee that they have an exceptional likelihood of being perused. RFID information being problematic, there exists a wide range of new tests connected with the present RFID data management systems. By utilizing the fuzzy technique as a measure to control the uncertainty occurring in RFID data, for the purpose of change of the technology. (GAD, L. 2006).

1.1 The Proposed Fuzzy Technology to Control the Uncertainty In RFID Data

The computer word rationale is the dark and white universe of 0's and 1's mapping to false and correct qualities separately. Anyhow, the genuine true takes various qualities between these two numbers. Furthermore questionable matter is a term lying between the extent of these accurate and false limits. Uncertainty future matter further brings about absence of full and exact learning in the RFID framework. Also, delicate figuring systems (like fluffy rationale) as complimentary to the existing expected 46 procedures have demonstrated an extraordinary potential in taking care of issues existing in this present reality and in dubious environment. This part of the theory specifically proposes a strategy for following and regulating the measure of lack of determination happening in the crude RFID information. The proposed model begins working with the first uncertain and fragmented information being encouraged to the framework. This model is further based a set surrounded up of client supplied human dialect principles which further uses the nearby RFID framework environment information. This helps the machine and the framework originator in that the outcomes are all the more deliberately delineated or spoke to in RFID frameworks in this present reality.



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In the proposed methodology, a fluffy model called RFID fluffy derivation framework has been outlined with clamor (false positive peruses) and recognition rate of the onlooker, as data parameters. Taking into account these info parameters, induction administers were composed. What added up to 15 such manages were planned which were restrictive "if-then" runs dependent upon the info parameters being sustained to the system. These principles were then supplied to represent the RFID fluffy derivation framework sufficiently. At that point enrollment capacities were planned comparing to the data variables commotion and identification ate and their comparing plots were outlined out utilizing Matlab Version 7.0.1. Participation capacities comparing to the information and yield parameters were chosen as triangular enrollment capacities because of their effortlessness and sustained to the proposed RFID fluffy induction framework and outcomes were drawn.

2. Effective Utilization of RFID for Human Intensive Care Purposes

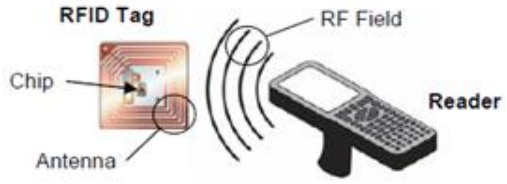
(Hea 2006) according to a survey information an average of 195'000 people in the USA died in hospitals in each of the years 2000, 2001 and 2002 as a result of hypothetically preventable, in-hospital medical errors [Hos04].(Lin) declares that "bad people are not the problem in health care the problem is that good people are working in bad conditions that made them helpless and it is harmful for people health ".

(Sen 2001) Radio Frequency Identification (RFID) is a technique that storing and retrieving all data using devices called RFID *tags* or transponders. An RFID tag is a small object, such as an adhesive sticker, that can be attached to or incorporated into a product. RFID tags are composed of an antenna connected to an electronic chip. These chips transform the energy of radio-frequency queries from an RFID *reader* or transceiver to respond by sending back information they enclose.RFID application play a very important role in health care activities , because in healthcare field RFID have number of functional implementation, spanning the functions of identification, tracking, sensing and automatic data collection; and addressing patient safety, quality of care, operational efficiencies, and the effectiveness of care, among others. There is a high concentration of applications such as; Impact on excellence and stability of care, patient protection and safety, and on the effectiveness and efficiency of care delivery. Multi-function and multi-purpose RFID applications used for human health care. Ambient intelligence solutions. 5-year horizon scalability. (Botterman, M. and van Oranje, C May *2009).*

3. Implementation of Proposed Novel Privacy Framework for RFID & Related Countermeasures to Conceal the RFID Tag Existence.

In this section we present RFID tags, some related potential privacy threats and solutions to mitigate and prevent them.

A RFID tag is essentially a mechanism made out of a modest chip joined with a coil. The chip is basically a state machine with a memory, giving restricted space and computation competencies. The coil, which is ordinarily alluded to as the tag reception apparatus, is utilized to power the chip also as correspondence interface. Specifically, for the correspondence with such gadgets, an RFID tag spectator must be utilized Figure. The viewer radiates a radio recurrence (RF) field that by impelling through the loop forces the chip. In the meantime the onlooker fittingly adjusts the field to code summons sent to the chip, which thus answers to the viewer regulating the same field, so building a bi-directional correspondence. For a right read-tag face to face time the tag must be plunged into the spectator field region in order to accept enough power for its initiation. The working extends, specifically the base separation needed for a tag from a spectator to be activated, depends on the particular embraced RFID innovation and its lands, and distinctive results are accessible available (Gemalto 2012).



RFID Tag and Rader

3.1 Tag Data

In the connection of thing labelling RFID tags are ordinarily intended to store a portion of the complementary information in their memory:

Unique Item Identifier (UII) a number allocated to a particular thing and that is utilized to remarkably distinguish it. This field could be organized as per standards making this quality special on the world for unequaled. It is typically used to access a data base and get further information about the tagged item (GSI 2011). Tag Identifier (TID): a number particularly distinguishing a RFID tag itself, as physical gadget, and which is invested the tag memory by the tag producer around then of the gadget assembling. This field is regularly compose bolted, so not, one or the other it might be controlled not eliminate, and the fundamental intention is to make tag duplication harder when such gadgets are installed in things needing creativity affirmations (Mikko Lehtonen *et al.* 2009*)* Client information: generic information in regards to the labelled thing and put on the tag memory by the last client consistent with his requisition necessities. Such data is regularly assessment to utilizing a RFID reader tending to the diverse tags memory areas. We call attention to that, in standard, a spectator could be likewise permitted to compose information on a tag, contingent upon the received tag engineering and the characterized provision.

4. How to Effectively Utilize the Time Gap when the RFID Reader is Waiting for the RFID Tag to Respond to an Earlier Transmitted Command After Pre-Computation of One or More Commands and what Technique to Apply in such a Realistic Scenario.

An alternate of the critical disobedient issues right now overall in the RFID frameworks is that of the huge correspondence time in a RFID framework. Fundamentally our work concentrates on the time crevice use when a RFID onlooker is holding up for the RFID tag to react back. Indeed, much of work has been created on RFID frameworks execution and RFID correspondence, yet a quickening strategy as the one proposed in this work is considered absent in the written works.

The proposed hereditary calculation is intended to minimize the by and large time needed for rescheduling of all the accessible charges in RFID spectator frameworks. Reenactment comes about were completed in Matlab 7.0.1. The end model of the proposed hereditary calculation was the populace size of 100. The reenactment comes about uncovered that the contrast between the due date times needed to process and the booking time of the orders is minimized as the proposed hereditary calculation achieves an attractive fitness level. Subsequently, the proposed hereditary method for RFID spectator charges booking unmistakably helps execution upgrade in RFID frameworks.

VI. CONCLUSION

This research has led an investigation of another approach to enhance the execution of existing RFID frameworks. The displayed work has effectively turned out with novel quickening systems for assorted RFID execution issues utilizing different other approaching methodologies like fuzzy rationale and Genetic calculations. Such a study is required to verify if the existing RFID frameworks are prepared for the following era Internet-of-things and distributed computing scenario in this setting, this proposition helps the comprehension of the differing set of execution issues connected with the present RFID frameworks.

VII. FUTURE RECOMMENDATION

This segment exhibits the outline of conceivable and guaranteeing future work that could be done taking the put forth fill in as a benchmark. The accompanying focuses abridge the exact plans identified with prospective headings of the work put forth in this theory:

- Further stimulation of the era of plans with respect to improvement of capacities of the proposed quickening systems might happen.
- Accelerating techniques related with the security features in the present RFID systems may be designed.
- Neural system practice for inducing intelligence in the accessible accelerating approaches may be integrated.
- Some of the existing accelerating techniques to supply towards the present most conversed off network-of things model may be used.
- The execution of the request layer oriented architecture for RFID systems may be comprehensive to include the support for the collision issue hoisted to making necessary alteration at the communication layer.
- Support for cloud services may be associated with the proposed application layer oriented architecture for RFID systems.

VIII. RESEARCH GAPS

The RFID technology is an emerging area of research and still it is on its initial adoption phases yet facing several research gaps which has to be addressed. The gaps are existed between the performance of RFID systems and its associated issues. Due to various real time uncertainty limitations in such systems, the Faraday Cage (to wrap up the Tag with foil) technique preventing to intercept electromagnetic waves, i.e, ID-Queries, in order to prevent the tag from emitting response to reader. The soft computing practices like fuzzy logic (to map the real-world uncertainty), Complex security schemes (Hash Locking/Kill Commands), Countermeasures to emit extra data (Jamming) techniques are yet to be applied to such systems in order to effectively address the problems in existing RFID systems leading to enhanced privacy and performance.

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