RFID Based Application Algorithms for Communication System: A Literature Review

Jitendra Damade
Department of Electronics & Telecommunication, Jabalpur Engineering College
Jabalpur, Madhya Pradesh, Pin-482011, India
jitendrageist09@gmail.com

Dr. Agya Mishra
Department of Electronics & Telecommunication, Jabalpur Engineering College
Jabalpur, Madhya Pradesh, Pin-482011, India
agyamishra@gmail.com

***Abstract*— Radio Frequency Identification (RFID) technology is being most popular in the field of communication, privacy and security for modern society. Today's high demand of fast, accurate, cost effective, easy to implement, stable and reliable system. RFID has shown its potential and it can overcome the limitation of existing system. As per the requirement it can integrate with key technologies and may used for accurate real-time indoor positioning and tracking. This review discusses the various existing algorithms and their applications. The comparison of existing algorithms is given in terms of applicability, measuring parameters, advantages and limitation. This literature review concludes with the best algorithm for accurate real-time indoor RFID positioning and tracking.**

***Keywords* -** *RFID Indoor positioning and tracking; RSSI; EKF; UKF; EFIR filtering; RCCAA.*

I. INTRODUCTION

Due to the miniaturization, low cost, fast deployment, reuse, and accuracy of management, the radio frequency identification (RFID) system has been widely adopted for identification applications [3], including security systems, asset management, consumer goods tracking, and identification of products at check-out points and many more. Real time localization has a great challenges to develop the statistical model for minimizing the localization error and provide accurate positioning, current research in this field has been provide a dedicated opportunity to the researchers to accommodate the knowledge to develop a new algorithm to deal with issues raised during the unique identification and online (real-time) tracking, positioning of objects/obstacles equipped with RFID tags and readers.

A strong application of RFID technology were found in [1] to developed an RFID based algorithm for reducing the noise present in the RFID marker localization signal by bandpass IIR filtering method and triple summation method. Some advance application of RFID is also found in [2]-[4] to integrate RFID technology with some other technology for example in [2] we found that the Smartphone-based system is integration is integrated with RFID system to identify, control and managing the traffic congestion and in [3] proposed a novel automated system for parking management and vehicle identification by integration of RFID to the Optical Character Recognition (OCR) which acts as solution for vehicles which are not registered in the data base of the automatic parking system. Similarly in [4] an integration of two key technologies i.e. RFID and Wireless Sensor Network (WSN) were proposed. RFID provides unique identity to the object while WSN gives information about the physical condition of the object by sensing environmental condition and surrounding such as temperature, humidity, pressure, light, sound and vibration.

However the application of RFID technology is no more limited it has the one step further to the present existing technology being in use and it give us an advance tool to develop and improve the existing one for more secure, reliable and cost effective solution for human society. Space localization and tracking is one of research hot spot in RFID. RFID location and tracking system locates the space position of target objects by measures the signal strength between the RFID reader and the tags which are deployed on the target objects. Jiali Zheng et al [5] proposed a relation aggregation algorithm based on RFID to achieve accurate indoor localization which reduce the mean localization error effectively and improve the accuracy of indoor localization. Another advance tracking method was proposed in [6] for indoor RFID system, including estimation dynamic model on the estimated states and nonlinear fusion estimation algorithm for variable-irregular sampling measurement and two estimation methods are given based on Extended Kalman Filter (EKF) and Unscented Kalman Filter (UKF). Similarly in [7], an parallel irregular fusion estimation based nonlinear filter for indoor RFID tracking system were proposed based on EKF and UKF methods to achieving real-time indoor RFID tracking.

But in [8], the key method for tracking the moving target based on Interval Kalman Filter (IKF) was proposed to integrate target position of one preceding time point and reference tags position to estimate the current position and improve the positioning accuracy. Along with in [9], develop an automated positioning system for mobile robots from RSSI values obtained in real-time of a RFID reader, and treated by an EKF. But the accuracy of target self-localization in RFID tag information networks and grids critically affects its situation awareness. In RFID networking systems, target state can be observed over a big number of tags. For such a case the EKF algorithm is modified and a new extended unbiased finite impulse response (EFIR) filtering algorithm was developed in [10]. It was also noticed in [10] that redundant information captured from the tags allows increasing both the localization accuracy and system stability. The overall performance of passive UHF RFID systems depends heavily on the power level of the signal impinged on the tag which is a function of the multipath channel environment in which the reader and the tags are deployed. Thus to improve the performance of passive UHF RFID system by enhancing the power level of the signal impinged on the RFID tag a channel shorting equalizer (CSE) was proposed in [11]. In practical environment, tags cannot be read due to collisions. The maximum-weight-independent-set-based algorithm was proposed in [12] for the reader-coverage collision avoidance arrangement (RCCAA). The purpose of this review to provide a literature review of existing RFID based application algorithm for communication system. Also comparatively study of the different existing algorithms were done here to know the in-depth technology of RFID in the field of online tracking as well as in positioning in terms of minimization of localization error, positioning error and estimated covariance etc.

The rest of this paper is organized as follows. In section II, the RFID technology is discussed. In Section III, provides the complete literature review of RFID based few existing system with applied algorithms. In Section IV, comparison of various RFID based existing algorithm is provided. Finally, Section V concludes this review.

II. RFID TECHNOLOGY

Radio Frequency Identification is widely used for automatic identification. This technology uses radio waves to automatically detect an object and transmit its identity. As illustrated in Fig.1, four main components are involved: the transponder known as the tag, the interrogator known as the reader, a computer network that connects readers and transponders. The tags are used as unique identifiers of objects. They can be passive, active or semi-passive. The readers can read the tag's identification and other related information within the interrogation range by transmitting radio frequency signals through reader antennas to the tags and then receiving back scattered continuous wave signal transmitted from the tag. Hence, RFID tags cannot be read if tags are not within the range of a reader.

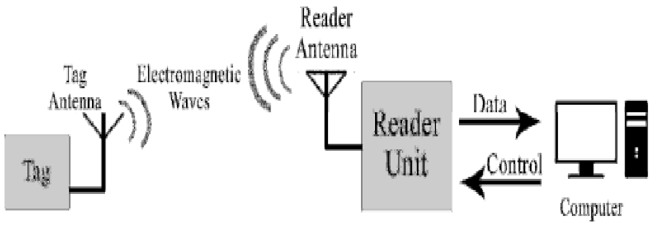

Figure 1. Components of an RFID system [2].

RFID technology has many operational frequency ranges for different typical read range, type of power supply and data rate which leads to using it for different application and purposes. An effective way for identification of object that are distant few meter from the reader passive ultrahigh frequency radio frequency identification (UHF RFID) technology being used having frequency ranges from 860 MHz to 960 MHz . In this frequency range we have the medium typical maximum read range of 1 to 10 meter having passive tag and few meter to 100 meter with active tag in addition with the maximum data rate to be achieved is fast as compared to LF and HF operational frequency range.

III. RFID BASED EXISTING SYSTEM

The area of RFID's applications has wider. As it is based on the automatic unique identification of objects which can seen to be strongly deployed in following systems – product tracking, supply chain management, auto-id center, medical and health care, manufacturing and production, retailing, standards and regulation, privacy issues and security aspects. Space localization and tracking is one of research hot spot in RFID. Here the system of indoor RFID positioning and tracking have considered for our discussion. Although the performance of RFID existing system is being concerned for better system performance, accuracy, reliability and stability.

A. RFID Positioning and Tracking

Unlike Global Positioning System (GPS) applied in the outdoor cases, radio frequency identification (RFID) can effectively get more accurate indoor location information. So RFID has been widely used in the indoor tracking systems [5]-[10], especially in the Internet of Things (IoT) system. Location information is one of the most important and frequently used contexts in many significant indoor tracking applications, such as asset tracking, industrial automation, goods management, supply chain management, and healthcare systems.

RFID location and tracking system locates the space position of target objects by measures the signal strength between the RFID reader and the tags which are installed on the target objects. The advantage of its localization mechanism makes RFID competent than GPS in the field of indoor position [5]. According to the localization mechanism, now there are mainly three kinds of RFID localization algorithms which include Received Signal Strength Indication (RSSI), Time of Arrival (TOA) and Angle of Arrival (AOA) [5].

1) Relation Aggregation Algorithm: To achive accurate indoor localization [5] the relation aggregation algorithm was praposed. It consist of three steps: a) exploring the relationship between reader received power and distance information then estimating Euclid distance of signal strength; b) employing k-Nearest Neighbour algorithm to aggregate the relationship between nearest reference tag and target tag; c) optimizing relational aggregation operator to obtain the coordinate of target tag. This algorithm can reduce mean localization error effectively and improve the accuracy of indoor localization. To obtain accurate positon of target tag, k-Nearest Neighbour (KNN) algorithm is employed in [5] by obtaining accurate relationship of received power and distance information. The mean localization error MEE can be obtained by following equation:

$$MEE = \frac{1}{M} \sum_{1}^{M} \sqrt{(x-x_0)^2 + (y-y_0)^2} \tag{1}$$

Here the actual coordinate of target tag is (x_0, y_0), the estimated coordinate of target tag is (x, y) and M denotes the number of experiments. Under this experiment condition, the mean localization error is 1.0135 meter. Reference [5] had employed twelve reference tags and twelve power levels to locate the target tag. From that it can be observe clearly that the distance accuracy is improved greatly and mean localization error is reduced to 0.6044 meter.

2) Centralized Fussion Estimation Algorithm: RFID tracking involves the problem of sensor fusion with the variable number. Because of the random location of the readers, some locations may not be measured, while some locations of the target maybe have several measurements from multiple sensors at the same time. Based on the non linear measurement model, in [6] gives two centralized fusion estimation methods based on the Extended Kalman filter (EKF) and Unscented Kalman filter (UKF). The estimation covariance is calculated as:

$$P(t_i|t_i) = P(t_i|t_{i-1}) - \sum_{n=1}^{N(t_i)} K_n(t_i) S_n(t_i) K_n^T(t_i) \tag{2}$$

JIN Xue-bo et al [6] had cosidered to placed 19 RFID readers on the simulation platform. Fig. 2 gives the estimation results of the EKF-based method and the estimation covariance is 49.27 14 in the horizontal axis and 38.5249 in the vertical axis. Comparing with UKF (Fig. 3), we notice that the total estimation covariance of EKF is larger, while the estimation does not get the special worse significantly at low detection rate area. The reason is that the nonlinear measurement model has been linearized in EKF estimation method, so the distance measurement mode didn't affect the estimation. But because of the measurement model errors caused by linearized mechanism, the estimation performance decreased totally. Therefore the estimation performance of the EKF is worse than UKF in the RFID indoor tracking system.

3) Parallel Irregular Fussion Estimation Algorithm: RFID tracking involves the problem of sensor fusion with the variable number. Because of the random location of the readers, some locations may not be measured, while some locations of the target maybe have several measurements from multiple sensors at the same time.

In practical RFID tracking systems, usually it is impossible that the readers are placed right with a “grid” structure, so effective estimation method is required to obtain the accurate trajectory. Due to the data-driven mechanism, measurement of RFID system is sampled irregularly; therefore the traditional recursive estimation may fail from K to K + 1 sampling point. Moreover, because the distribution density of the readers is non-uniform and multiple measurements might be implemented simultaneously, fusion of estimations also needs to be considered. Thus an irregular estimation strategy with parallel structure was developed, where the dynamic model update and states fusion estimation were processed synchronously to achieve real-time indoor RFID tracking. Two nonlinear estimation methods were proposed [7] based on the extended Kalman filter (EKF) and unscented Kalman filter (UKF).

The general EKF method linearizes the nonlinear system by Taylor series method and then applies the Kalman filter to obtain the state estimates. It has obtained much interest because of its relative simplicity and demonstrated efficacy in handling nonlinear systems.

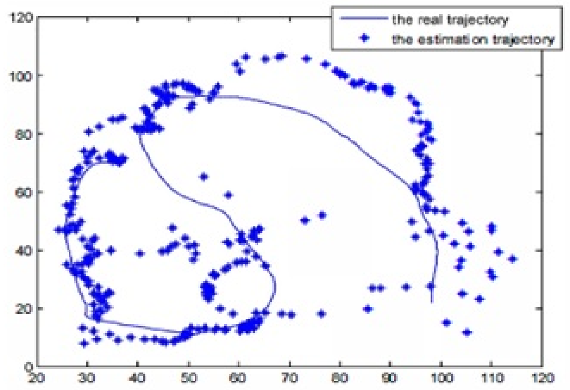

Figure 2. The real trajectory and the estimation trajectory by EKF [6].

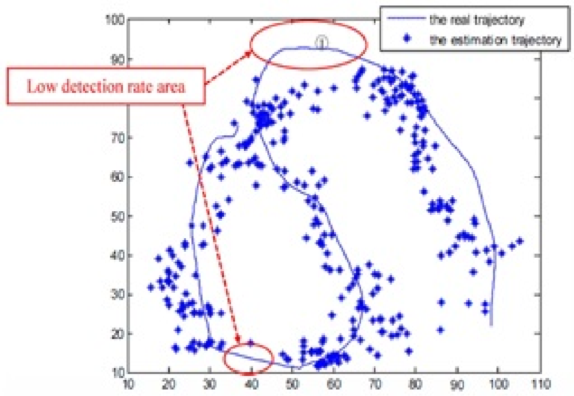

Figure 3. The real trajectory and the estimation trajectory by UKF [6].

The proposed EKF-based tracking algorithm is implemented in [7] and the estimation covariance is given by:

$$P^{-1}(t_i|t_i) = P^{-1}(t_i|t_{i-1}) + \sum_{n=1}^{N(t_i)} h_{nx}^{-1}(t_i)\mathrm{R_n}(t_i)\mathrm{h_{nx}}(t_i) \tag{3}$$

UKF propagates the so-called sigma points by function evaluations using the unscented transformation (UT), and this is at first glance very different from the standard EKF algorithm which is based on a linearized model. Then the following fusion estimation algorithm based on UKF is proposed in [7] and the estimation covariance is given by:

$$P(t_i|t_i) = P(t_i|t_{i-1}) - \sum_{n=1}^{N(t_i)} K_n(t_i)R_n(t_i)K_n^T(t_i) \tag{4}$$

Additionally, in the low detection rate area, the approximate movement direction of the target could also be estimated. Once enough measurements were obtained, the estimation error reduced rapidly. For the UKF-based method, this was achieved because the update process could continue with the estimated velocity and acceleration when there is lack of measurement data. However, the EKF-based method did not perform well in such area. The reason is that the nonlinear measurement model has been linearized, and some measurement information has been lost; therefore the estimation might not be that accurate. In the Fig. 4 it is shown that the in the most cases the developed UKF method has less covariance as compared to that of the developed EKF method.

4) Interval Kalman Filter Algorithm: Ning Li et al [8] develop an algorithm of passive RFID indoor positioning based on interval Kalman filter, according to the geometric constraints of responding tags, combined with the target motion information. The interval Kalman filter is adopted to integrate target position of one preceding time point and reference tags position to estimate the current position. Advantage of this algorithm is to use passive tags to reduce hardware costs, and on the other hand the introduction of filtering algorithm improves the positioning accuracy. Obviously, the standard Kalman filter algorithm is not suitable for the uncertain linear interval system describes in (5).

$$\begin{cases} x_{k+1} = A_k^I x_k + B_k^I \zeta_k \\ y_k = C_k^I x_k + \eta_k \end{cases} \tag{5}$$

where A_k^I, B_k^I and C_k^I are interval matrices which describe the uncertainty of model parameter. Also $k = 0, 1, 2, 3, \ldots$, A_k^I, B_k^I and C_k^I are $n \times n$, $n \times p$ and $q \times p$ coefficient matrices. Interval Kalman filter is proposed by Guanrong Chen who introduces the idea of interval arithmetics into standard Kalman filter. The derivation process of interval Kalman filter is similar with standard Kalman filter and both have the same part of nature. It is employed to filter noise signal and improve positioning accuracy, such that high positioning accuracy and low cost can be achieved. It was shown in [8] that the interval Kalman filter perform better when the target moves along a straight line and positioning error will increase in the corner. Moreover, the positioning error is smaller as tags are in triangular arrangement compared with that in the case of rectangular arrangement.

5) Extended Unbiased Finite Impulse Response (EFIR) Filtering Algorithm: Accuracy of target self-localization in RFID tag information networks and grids critically affects its situation awareness. With an insufficient localization accuracy, information about local 2D or 3D surroundings delivered to a target by request may provoke collisions, even fatal. In RFID networking systems, target state can be observed over a big number of tags. For such a case, the extended Kalman filter (EKF) algorithm was modified and a new extended unbiased finite impulse response (EFIR) filtering algorithm was developed in [10]. We show that redundant information captured from the tags allows increasing both the localization accuracy and system stability. It was also noticed in [10] that the EFIR filter has much stronger protection against divergency and instability than EKF in the RFID tag grid-based localization. The application of the EFIR is that it can be applied in localization using tags nested on indoor boundaries for both of the fully or not fully known noise statistics, and robot travelling on a passway. It can be shown by Fig. 5 that deviations from the actual noise covariances in nonlinear state-space models may cause divergence in EKF. It was also revealed that the EKF becomes addicted to divergence if $p < 1$. Note that the EFIR filter is p–invariant and thus protected against such sort of failures. But, the EFIR filter requires about N times more computation time to complete iterations.

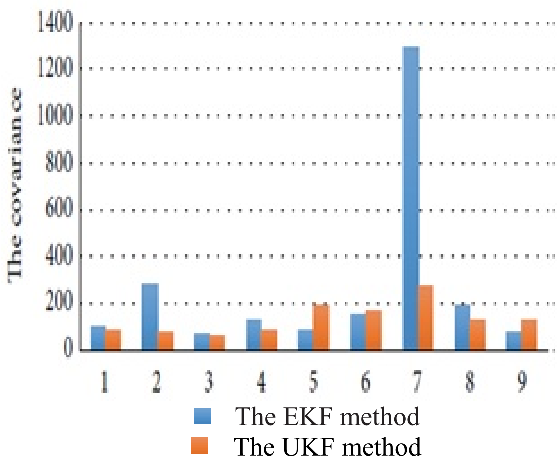

Figure 4. The covariance comparison of the developed methods UKF and EKF [7].

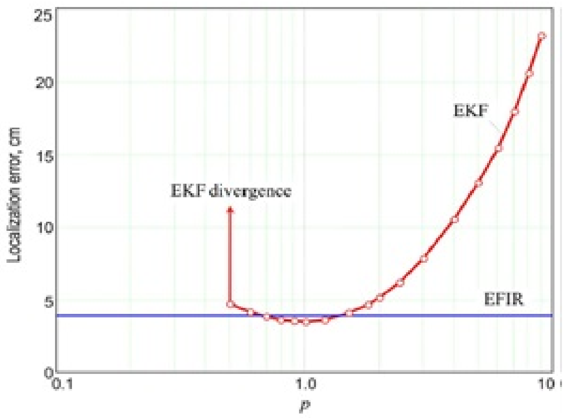

Figure 5. Typical localization errors by EKF and EFIR filter as functions of p. The EFIR filter is p– invariant. The EKF diverges when $p < 0.5$ [10].

B. *Performance Enhancement System*

As every system have to seek for enhancing its performance and improve the overall behavior. RFID have been widely deployed to many systems as per the requirement. In the case of RFID system, its overall performance, accuracy and stability depends on the various factors. There are six factors that affect RFID reader rang namely antenna gain (detection range), antenna polarization, tag S.O.A.P. (Size Orientation Angle Placement), reader power setting, cables and environment factors. However, some other factors may also degrade the performance of the RFID system they can be a noise introduce by the external source of signal or by the adjacent channel, power level of the signal impinged on the tag [11] and reader-coverage collision [12] etc. These additional factors are treated by different algorithms to enhance the overall performance of the RFID system.

Location information is one of the most important and frequently used contexts in many significant indoor tracking applications, such as asset tracking, industrial automation, goods management, supply chain management and healthcare systems.

1) Noise Reduction of the Localization Signal: The actual problem of increasing the detection range of the passive single bit inductively coupled RFID transponders commonly called markers. The markers are being widely used to mark the position of underground networks such as cables, pipes etc. For digital processing and noise reduction of signals from the markers two methods are described in [1].

a) Ttiple summation method: This This method of noise reduction is suitable especially for signals of exponential order. The marker response signal is given by damped oscillation of the marker and such signals can be classified as signals of exponential order. The energies of the received signal in the first, second and third summation interval can be calculated and the energy of marker response signal without noise influence is calculated in [1]. The calculated values of E in the range from x=0.3 meter up to x=2 meter were approximated by blue regression curve:

$$E = 983.37x^{-11.34} \tag{6}$$

b) Noise reduction by IIR filter: The requirements on the digital filter goes out not only from the noise reduction necessity but from the working frequencies of markers. The simple IIR filter with bandpass filter with Butterworth approximation was designed by Matlab fdatool [1]. The maxima of filtered signal calculated as average of 19 consecutive repetitions of measuring time windows are dependence on the distance x. The regression curve was calculated for x=0.3 meter up to x =2 meter and its equation is given by:

$$y = 7.1006x^{-5.709} \tag{7}$$

The triple summation method requires less processor memory comparing to the IIR filtering but does not separate the adjacent channels used for marking of another underground networks. This problem is solved by digital filtering of the marker response signals but on the other side this method is not able to filter out the in-band interferences.

2) Channel Shorting Equilizer: The overall performance of passive UHF RFID systems depends heavily on the power level of the signal impinged on the tag which is a function of the multipath channel environment in which the reader and the tags are deployed. In UHF RFID systems, the reader interrogates RF tags by transmitting continuous wave (CW) signals that power up the internal integrated circuitry of the tags that in turn, backscatter these signals to the reader after embedding their unique information. Thus the channel shortening equalizer (CSE) with a new constraint that exploits the knowledge of the propagation channel and the nature of the CW signal was proposed in [11] to boost the power of the impinged signal on the tag. By claculating the probability of that the power of the received signal is less than a threshold l, $p(P_{y,s} \leq l)$. It can be shown that that for 95% of the cases, the proposed technique allowed usto maintain the power of the received signal at the tag superior or equal to the power of the CW signal. The results in [11] show that using the channel shorting equalizer enhances the power level significantly which results in better performance.

3) Reader-Coverage Collision Avidance Arrangement (RCCAA) problem Algortihm: In RFID systems, a tag can be read by a reader when the tag is within the reader's interrogation range. Reader deployment has received a great deal of attention for providing a certain service quality. Many studies have addressed deploying/activating readers such that all the tags in a field can be read. Bing-Hong Liu et al [12] had proposed an approximation algorithm, termed the maximum-weight-independent-set-based algorithm (MWISBA) for the RCCAA problem.

To evaluate the effectiveness of the MWISBA, a method that extended from the greedy distributed elimination (GDE) method, called the Extended Greedy Distributed Elimination Algorithm (EGDEA) [12], was proposed to compare with the MWISBA in terms of the number of tags read by readers and the number of activated readers. The comparison of the MWISBA, the EGDEA (d = 5) and the EGDEA (d = 15) was taken [12] for different cases.

a) Varying number of tags: The case in which the number of readers is 300, α = 10, the number of ranks of interrogation range is 3 (or 15) and the number of tags varies from 200 to 1000. The the ratio of the number of tags read by readers in the MWISBA to that in the EGDEA (*d* = 5) and the EGDEA (*d* = 15) in about 90% of the cases was between 1.06 and 2.40.

b) Varying number of readers: In this case the number of readers is 300, α = 10 the number of ranks of the interrogation range is 15, and the number of readers varies from 100 to 500. The ratio of the number of tags read by readers in the MWISBA to that in the EGDEA (*d* = 5) and the EGDEA (*d* = 15) in about 90% of the cases was between 1.31 and 3.69.

c) Varying α value: The comparison is taken when the number of readers is 300, the number of tags is 600, the number of ranks of interrogation range is 15, and the α varies from 5 to 25. The ratio of the number of tags read by readers in the MWISBA to that in the EGDEA (*d* = 5) and the EGDEA (*d* = 15) in about 90% of the cases was between 1.10 and 4.55.

d) Number of activated readers: In this case the comparison is doen in term of the number of activated readers when the number of readers is 300, α = 10, the number of ranks of interrogation range is 15 and the number of tags varies from 200 to 1000. The ratio of the number of activated readers in the MWISBA to that in the EGDEA (*d* = 5) and the EGDEA (*d* = 15) in about 90% of the cases was between 1.18 and 15.07.

e) Tag distributed in a nominal distribution: The comparison is taken terms of the number of tags read by readers when the number of readers is 300, α = 100, the number of ranks of interrogation range is 15, and 1000-5000 tags were normally distributed in a 200 × 200 square area. The ratio of the number of tags read by readers in the MWISBA to that in the EGDEA (*d* = 5) and the EGDEA (*d* = 15) in about 90% of the cases was between 1.05 and 1.68.

Finally, it can be shown that the readers activated by the MWISBA can read a significantly higher number of tags than that in the EGDEA [12]. To guarantee that readers do not interfere with each other, the readers can be scheduled by the MWISBA to select suitable interrogation range and reader can collect the tag ID without collision. According to the result [12] it can be say that the MWISBA will not deploying readers to fully read all tags without collisions in RFID networks.

IV. COMPARISON

The different existing RFID based algorithms for communication system applications particularly which have discussed in the above section is being compared on the basis of their purposes to use in the RFID system, the performance measured check points along with their respective advantages and limitations are tabulated as follows:

Table I. Comparison of RFID Based Algorithms

Sr. No.	**Algorithm Used**	**Application for the Purposes and for System**	**Performance Measured /Efficiency Check Value**	**Advantages**	**Limitations**
1.	Triple Summation Method (TSM) and IIR Filter [1]	TSM – Noise reduction of the localization Signal IIR – Increasing the range of the RFID marker	TSM – Energy of marker response signal without noise influence (0.3793 V/m at 2m) IIR – Maximum filtered signal voltage (0.157 V at *x* = 2 meter)	TSM – Required less processing memory comparing to IIR filtering IIR – Separate the adjacent channel	TSM – Does not separate the adjacent channel and not able to filter out the in-band interference IIR – Localization is possible up to 2 m distances
2.	Integration of Smartphone-based system with RFID Technology [2]	-Current location, viewing notification about traffic congestion -Reducing traffic congestion	-Implementation cost of the hardware and software	-More user friendly -It provides rapid and continuous tracking of vehicle with minimum human contribution	-Only working with Android platform, need to develop an iOS application to operate under iOS devices
3.	OCR and RFID Technology [3]	-Automated vehicle identification, parking system and management	OCR – Store number plate recognition output information to database RFID – Verify and store the date and time	-Automated vehicle recognition -Reduce the wastage of space in database	

4.	Integration of Wireless Sensor Network (WSN) with RFID Technology [4]	-Areas where unique identity and physical condition of the object are required	-The no. of sensor node that communicate with base station and number of RFID tag integrated with them	-Integrated tag can communicate with each other as well as other node -Avoiding idle listening of sensor node -Energy efficient operation and has no severe shortcoming	-Interference may exist -Has many to one traffic pattern -Interference avoidance may result in addition overheard
5.	Relation Aggregation Algorithm [5]	-Accurate indoor location of target tag /object	-Mean Localization Error (MEE) (0.5389 for 8 reference tag with 12 identification power level)	-Reduce MEE effectively -Improve the accuracy in indoor localization -Accurate position of target tag can be obtain	-Not accurately satisfied to track the object in real-time
6.	Centralized Fusion Estimation Algorithm (EKF and UKF) [6]	-Indoor RFID tracking system	-Estimation Covariance (49.2714 in the horizontal axis and 38.5249 in the vertical axis for EKF)	-Provide better estimation performance -It will still work in the low detection rate area.	-Can’t use to calculate the dynamic parameters and estimated trajectories of the target simultaneously in parallel
7.	Parallel Irregular Fusion Estimation Algorithm (based on the EKF and UKF) [7]	-Real-time indoor RFID tracking system	-Estimation Covariance /trajectory UKF (43.7320 in horizontal axis and 30.1378 in longitudinal axis) EKF (38.1568 in horizontal axis and 44.8470 in longitudinal axis) - Calculating time	-UKF – better estimation performance even when the target steps into the low detection rate area -EKF – totally parallel structure is suitable for fast online tracking	-EKF method cost the least calculating time more than UKF-related method
8.	Interval Kalman Filter (IKF) Algorithm [8]	-RFID indoor Positioning	-Positioning Error	-Able to track the moving target better in linear motion -Improve the positioning accuracy by reducing the positioning error	-Positioning error will increase in corner -Positioning error is more when target are arranged in rectangular compared to triangular arrangement.
9.	Received Signal Strength Identification (RSSI) and EKF [9]	-Automated Positioning system	-Standard Deviation (± 0.03 m) -Nominal Position (Maximum 1.01 m & Minimum 0.09 m)	-Faster response related to the signal detection for collision avoidance	-Limited to positioning up to few meter (1.01 meter)
10	EFIR Filtering Algorithm/Kalman Algorithm [10]	-Localization using tag nested in indoor boundaries -Robot travelling on passway	-Localization Error (1.2 cm to 0.52 cm For fully known Noise Statistic)	-Localization accuracy and system stability increases -More successful in accuracy by increasing number of detected tag	-EFIR requires about N times more computation to complete iteration -Divergence in EKF caused by error in noise covariance

11.	Channel Shorting Equalizer (CSE) [11]	-Enhance the power level of the signal impinged on the tag	-Probability that the power of received signal is less than the threshold l (0.95), Metric G_t (218.44% for $v = 12$)	-Achieve the good trade-off between channel shorting and received power enhancement	
12.	Maximum-Weight-Independent-Set-Based Algorithm (MWISBA) And EGDEA [12]	-For avoidance the RCCAA Problem	-Ratio of the no. of tags read by the reader in MBISBA to that in the EGDEA for different cases (for Tag Distributed in a Normal Distribution is from 1.05 to 1.68)	-MWISBA can read higher number of tag than EGDEA without collision -The reader can be scheduled by the MWISBA to select suitable interrogation range. -Reader can collect the tag ID without collision	-Not fully reliable to read all tags without collision in RFID networks

V. CONCLUSION

It is necessary to consider the manoeuvring target in the RFID tracking system. When the tag is within the RFID measurement space, the distance between the tag and readers can be extracted from RSSI. Because of the characteristics of the measurement process in the indoor RFID tracking system, the distances obtained by RFID are multivariate, irregularly sampled, uncertain, and nonlinear. As we have shown that the RFID technology may integrate with key technology for e.g. Smartphone system, OCR and WSN which ultimately reduce the implementation cost of the hardware and software. This paper has provided a literature survey and analyzes the various RFID based application algorithms in terms of their applicability, measuring parameters, advantages and limitation.

However, the various algorithm used for indoor RFID localization and tracking have a great challenges to minimize the localization error, estimation covariance and improving the stability or accuracy of the system. Among them the UKF/EKF algorithm and EFIR filtering algorithm have better estimation performance in low detection range area and more successful in accuracy by increasing number of detected tag, respectively. Finally we conclude our literature review to understand the limitations of existing algorithm and seek to improve them by proposing the new algorithm in future.

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