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CHILDREN TRACKING SYSTEM USING UHF RFID AND OFDM SIGNAL

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Abstract— Recently in all over the world in every 40 seconds child becomes missing or kidnapped. The increasing prevalence of children wandering has many parents very concerned. Everyone can see and read many stories about children's or students who are kidnapped or not reaching homes. Most of the stories have had tragic endings. This project focuses on implementing children tracking location system for every child attending school. To address this challenge, children tracking system was designed based on RFID technology, where children carry RFID tags and the system is responsible for locating the children by aggregating the readings from the deployed readers. Noting the importance of localized processing for efficient children tracking, study how the locally available computing resource, such as the mobile devices carried by the park employees and visitors, can be utilized for service provisioning. Since mobile devices have limited energy, study on energy efficiency optimization problem are considering the resource allocation and user association. The formulated problem is solved by a dynamic updating matching approach. To obtain the energy efficiency without the loss of signal the OFDM (Orthogonal Frequency Division Multiplexing) is used which provide the more efficiency compared with the existing system.

Index Terms—RFID, tracking children, energy efficiency

1. INTRODUCTION

The Internet of things (IoT) is the extension of Internet connectivity into physical devices and everyday objects. Embedded with electronics, Internet connectivity, and other forms of hardware (such as sensors), these devices can communicate and interact with others over the Internet, and they can be remotely monitored and controlled. IOT (Internet of Things) is an advanced automation and analytics system which exploits networking, sensing, big data, and artificial intelligence technology to deliver complete systems for a product or service. These systems allow greater transparency, control, and performance when applied to any industry or system. The Internet of things (IoT) is the network of physical devices, vehicles, home appliances, and other items embedded with electronics, software, sensors, actuators and connectivity which enables these things to connect, collect and exchange data. IoT involves extending Internet connectivity beyond standard devices, such as desktops, laptops, smart phones and tablets, to any range of traditionally dumb or non-internet-enabled physical devices and everyday objects. Embedded with technology, these devices can communicate and interact over the Internet, and they can be remotely monitored and controlled. With the arrival of driverless vehicles, a branch of IoT, i.e. the Internet of Vehicle starts to gain more attention.

1.1 IOT – KEY FEATURES

The most important features of IoT include artificial intelligence, connectivity, sensors, active engagement, and small device use. A brief review of these features is given below

- **AI** – IoT essentially makes virtually anything "smart", meaning it enhances every aspect of life with the power of data collection, artificial intelligence algorithms, and networks. This can mean something as simple as enhancing your

refrigerator and cabinets to detect when milk and your favorite cereal run low, and to then place an order with your preferred grocer.

- **Connectivity** − New enabling technologies for networking, and specifically IoT networking, mean networks are no longer exclusively tied to major providers. Networks can exist on a much smaller and cheaper scale while still being practical. IoT creates these small networks between its system devices.
- **Sensors** − IoT loses its distinction without sensors. They act as defining instruments which transform IoT from a standard passive network of devices into an active system capable of real-world integration.
- **Active Engagement** − Much of today's interaction with connected technology happens through passive engagement. IoT introduces a new paradigm for active content, product, or service engagement.
- **Small Devices** − Devices, as predicted, have become smaller, cheaper, and more powerful over time. IoT exploits purpose-built small devices to deliver its precision, scalability, and versatility.
- IoT software addresses its key areas of networking and action through platforms, embedded systems, partner systems, and middleware. These individual and master applications are responsible for data collection, device integration, real-time analytics, and application and process extension within the IoT network.
- **Data Collection**-This software manages sensing, measurements, light data filtering, light data security, and aggregation of data. It uses certain protocols to aid sensors in connecting with real-time, machine-to-machine networks. Then it collects data from multiple devices and distributes it in accordance with settings. It also works in reverse by distributing data over devices.
- **Device Integration**-Software supporting integration binds (dependent relationships) all system devices to create the body of the IoT system. It ensures the necessary cooperation and stable networking between devices. These applications are the defining software technology of the IoT network because without them, it is not an IoT system. They manage the various applications, protocols, and limitations of each device to allow communication.
- **Real-Time Analytics**-These applications take data or input from various devices and convert it into viable actions or clear patterns for human analysis. They analyze information based on various settings and designs in order to perform automation-related tasks or provide the data required by industry.
- **Application and Process Extension**-These applications extend the reach of existing systems and software to allow a wider, more effective system. They integrate predefined devices for specific purposes such as allowing certain mobile devices or engineering instruments access. It supports improved productivity and more accurate data collection.

1.2 INTERNET OF THINGS - TECHNOLOGY AND PROTOCOLS

IoT primarily exploits standard protocols and networking technologies. However, the major enabling technologies and protocols of IoT are RFID, NFC, low-energy Bluetooth, low-energy wireless, low-energy radio protocols, LTE-A, and WiFi-Direct.

NFC and RFID

RFID (radio-frequency identification) and NFC (near-field communication) provide simple, lower energy, and versatile options for identity and access tokens, connection bootstrapping, and payments.

- RFID technology employs 2-way radio transmitter-receivers to identify and track IDs associated with objects.
- NFC consists of communication protocols for electronic devices, typically a mobile device and a standard device.

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Low-Energy Bluetooth

Technology supports the low-power, long-use need of IoT function while exploiting a standard technology with native support across systems.

Low-Energy Wireless

Low-Energy Wireless technology replaces the most power hungry aspect of an IoT system. Though sensors and other elements can power down over long periods, communication links (i.e., wireless) must remain in listening mode. Low-energy wireless not only reduces consumption, but also extends the life of the device through less use.

Radio Protocols

ZigBee, Z-Wave, and Thread are radio protocols for creating low-rate private area networks. These technologies are low-power, but offer high throughput unlike many similar options. It increases the power of small local device networks without the typical costs.

LTE-A

LTE-A, or LTE Advanced, delivers an important upgrade to LTE technology by increasing not only its coverage, but also reducing its latency and raising its throughput. It gives IoT a tremendous power through expanding its range, with its most significant applications being vehicle, UAV, and similar communication.

WiFi-Direct

WiFi-Direct eliminates the need for an access point. It allows P2P (peer-to-peer) connections with the speed of WiFi, but with lower latency. WiFi-Direct eliminates an element of a network that often bogs it down, and it does not compromise on speed or throughput.

3.SYSTEM ANALYSIS

3.1 EXISTING SYSTEM

In the existing system a new child tracking system based on UHF RFIDs. Similar to previous works, UHF RFID was developed to fasten the passive RFID tags on children. When the children play in a theme park, their tags would be read by the nearby fixed readers with wireless communication capability. These fixed readers are deployed by a service provider, such as the theme park, to cover the whole activity area of children. The service provider obtains the locations of children by aggregating the readings of these readers.

To avoid the potential congestion problem in the centralized design, utilize the mobile devices carried by the park employees and visitors as the local processing units. In so doing, raw reading data is not sent to the remote control center for data processing. With the help of remote control center, the reader finds a mobile device for data processing. Then, the associated mobile device/local processing unit delivers the processed data to users.

In practice, some of the users may locate in the communication range of associated mobile devices. Thus, the associated mobile devices directly transmit the data to the users in the transmission range. For the users out of the communication range of associated mobile devices, the remote control center serves as the relay for data transmissions. Since mobile devices have limited energy, if they consume too much of their energy quickly, there are not enough number of local processing units that support the service for users. To fully exploit the mobile devices for service provisioning, formulate an energy efficiency (EE) optimization problem by jointly considering power allocation and user association. The EE optimization problem was addressed by adopting the dynamic updating matching algorithm.

3.1.1 DISADVATAGES

- High cost
- Network problems may occur.
- Not suitable for long distance.

3.2 PROPOSED SYSTEM

In the proposed system a new children tracking system based on UHF RFIDs with the OFDM signal is developed. UHF RFID with the OFDM signal is propose to fasten the passive RFID tags on children. When the children play in a theme park, their tags would be read by the nearby fixed readers with wireless communication capability. These fixed readers are deployed by a service provider, such as the theme park, to cover the whole activity area of children. The

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service provider obtains the locations of children by aggregating the readings of these readers.

In practice, some of the users may locate in the communication range of associated mobile devices. Thus, the associated mobile devices directly transmit the data to the users in the long-distance range by using the OFDM signal. By using the OFDM signal it extend the communication range of the signal. For the users out of the communication range of associated mobile devices, the remote control center serves as the relay for data transmissions. Since mobile devices have limited energy, if they consume too much of their energy quickly, there are not enough number of local processing units that support the service for users. To fully exploit the mobile devices for service provisioning, formulate an energy efficiency (EE) optimization problem by jointly considering power allocation and user association. The EE optimization problem was addressed by adopting the dynamic updating matching algorithm. If the tag is removed from the children hand, then the immediate alert message with the location is send to the parents mobile where the app is installed. Then the parents can able to identify the last location of the children where the ID is missed.

3.2.1 ADVANTAGES

- An efficient way to enhance the performance of energy efficiency.
- EE optimization problem was solved.
- Suitable for long distance.

4. SYSTEM DESIGN

4.1 SYSTEM ARCHITECTURE

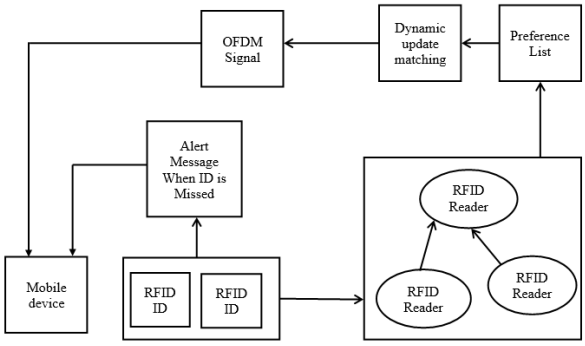

Fig:System Architecture

In the Fig, it shows that the RFID ID in the child was read by the RFID Reader. The preference list was initially established. The basic idea to establish the preference of a mobile device is to use knowledge from previous time period to obtain the set of neighboring nodes. Then dynamic update matching was performed in the mobile device and the location was provided to the end users. The OFDM signal is used for the long-distance communication. When the ID is removed then the alert message is send to the mobile phone where the app is installed.

5. SYSTEM IMPLEMENTATION

5.1 READING DATA

In the first module, Id attached on child is called target Id and Id attached on normal visitor is reference Id. When the children play in a theme park, their IDs would be read by the nearby fixed readers with wireless communication capability. These fixed readers are deployed by a service provider, such as the theme park, to cover the whole activity area of children. The service provider obtains the locations of children by aggregating the readings of these readers. To avoid the potential congestion problem in the centralized design, utilize the mobile devices carried by the park employees and visitors as the local processing units. In so doing, raw reading data is not sent to the remote control center for data processing. With the help of remote control center, the reader finds a mobile device (e.g., smartphone) for data processing. Then, the associated mobile device/local processing unit delivers the processed data to users. In practice, some of the users may locate in the communication range of associated mobile devices. Thus, the associated mobile devices directly transmit the data to the users in the transmission range. For the users out of the communication range of associated mobile devices, the remote control center serves as the relay for data transmissions. Since mobile devices have limited energy, if they consume too much of their energy quickly, there are not enough number of local processing units that support the service for users.

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5.2 PREFERENCE ESTABLISHMENT

The basic idea to establish the preference of a mobile device is to use knowledge from previous time period to obtain the set of neighbouring nodes. First set up the preference list of r_j. All readers establish their preference lists according to their benefit functions. The benefit of reader rj depends on the achievable data transmission rate, which can be characterized as $\mu C_{j,i}$ where μ is the benefit factor. Without loss of generality, set μ= 1. Thus, the preference list of r_j over device d_i at time slot t is$V^R_{j(t)}$.The preference establishment of a mobile device was established. Mobile device d_i sets up its preference based on its transmission cost function. The model d_i's preference and r_j's preference according to local maximum achievable EE with the set of neighbouring nodes at time slot t. Thus, Fast Iterative Power Allocation algorithm (FIPA) was developed to obtain the transmission power between device d_i and neighbouring nodes set $T_{j;i}$, which is obtained from the formulated local power allocation problem.

5.3 MATCHING PROCESS

When the preference establishment is completed, the matching was started. The Dynamic Updating Matching (DUM) algorithm was proposed which proceeds iteratively. The DUM algorithm has two stages. At the first stage, readers conduct the matching based on the preference list V^R_j . In each iteration, reader $r_i$proposes to its most preferred device d_i. After this, di is removed from preference list V^R_j . Then device di decides whether to accept or reject the proposal based on its preference list over the reader r_j . If there are more than one proposal, device d_i chooses to keep the reader r_j that it favors the most, and rejects the rest. The proposing and accepting/rejecting iterations run for as many rounds as needed until all readers are matched or all readers' preferences that are fully examined. Also consider the case all readers' preferences are fully examined but some readers are still unmatched. Let device d_i increase its accepting capacity and reader $r_j$updates its preference list based on the current matching. Then readers conduct the new matching based on the new preference lists.

5.4 OFDM SIGNAL

OFDM signal stands for Orthogonal Frequency-Division Multiplexing. It is a method of encoding digital data on multiple carrier frequencies. It is mainly used for the long-distance communication. OFDM is invariably used in conjunction with channel coding and almost always uses frequency and/or time interleaving OFDM is a combination of modulation and multiplexing. Multiplexing generally refers to independent signals, those produced by different sources. In OFDM the multiplexing is applied to independent signals independent signals is the subset of the one main signal. In OFDM the signal itself is first split into independent channels, modulated by data and then demodulated to create the OFDM carrier. OFDM is a special case of Frequency Division Multiplexing(FDM). If the ID is remove from the children, then immediately an alert message is sent to the parent mobile where the app is installed.

6. Conclusion and Future Enhancement

6.1 CONCLUSION

In our RFID networks with the OFDM signal, readers are associated with mobile devices for target localization. It is a method of encoding digital data on multiple carrier frequencies. It is mainly used for the long-distance communication. OFDM is invariably used in conjunction with channel coding and almost always uses frequency and/or time interleaving OFDM is a combination of modulation and multiplexing. With the help of remote control centre, the reader is matched with a mobile device to transmit raw data for processing. Then, the associated mobile device delivers the processed data to the users. Formulate the EE optimization problem by jointly considering resource allocation and user association. To address the EE optimization problem, the dynamic updating matching approach was developed. Finally, demonstrated that the proposed dynamic updating matching approach is an efficient way to enhance the performance of energy efficiency.

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6.2 FUTURE ENHANCEMENT

UHF RFID system provides the better security for the children who went outside lonely without their parents. Thus the computing and communication cost of matching process will increase. In the future work, the new technology will be used to reduce the matching-cost efficient solution with the mobile devices of high mobility. It also avoids the EE optimization problem more efficiently compared with the proposed work. In the future work the long distance signalling techniques can be used which provides more result compared to OFDM signal.

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