

# Real-Time Locating System for Industrial Management Using

## Ultrawideband (UWB)

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**Abstract** – There are various Real-Time Locating Systems (RTLS) available in the market. Each type of RTLS is used for different business solutions, depending on its range. There is an RTLS that gives the highest precision than ever, that is UltraWide band (UWB) RTLS. The objective behind this research is to develop an RTLS system using Ultra-Wide band Technology which will monitor employees working in the Manufacturing industry.

**Keywords:** RTLS, UWB, Employees, Industry, Anchor, Tag

### I. INTRODUCTION

In recent times, Real-time locating systems (RTLS) play an important role in many applications and give a stab at increasing the accuracy of precise indoor and outdoor positioning.

Many other technologies can be used for RealTime Locating System and RFID (Radio Frequency Identification), GPS, Bluetooth or Wi-Fi Technology and UWB Technology an example.

The fundamental idea behind Ultra-Wide band (UWB) technology is to evolve, transfer and obtain an extremely transient burst of radio frequency (RF) energy, generally a few nanoseconds in the period. These frequencies are coherently selected integer multiples of the fundamental clock. So, waveforms are immensely wide in bandwidth, so that it is tough to decide an actual Radio Frequency's center frequency. As bandwidth is contrarily related to pulse duration, the spooky extent of these waveforms can be made fairly large. With appropriate engineering design, the resultant density of energy can be extremely low. This low density of energy can be transfer into a low probability of detection (LPD) Radio Frequency signature. An Low probability of detection signature also achieve fewest interference to proximity systems and fewest Radio Frequency health hazards, notable for both military and business applications. It also can penetrate the objects as it does not require line of sight (LOS) and can work in multipath causing less interference with other systems that may be operating at that

moment. In general, the UWB system consists of anchors and tags. Anchors are devices that detect Ultra-Wide Band pulses released by the Tags and send them to the server for evaluating tag locality. Depending upon the area of coverage, a respective number of anchors are needed to be installed.

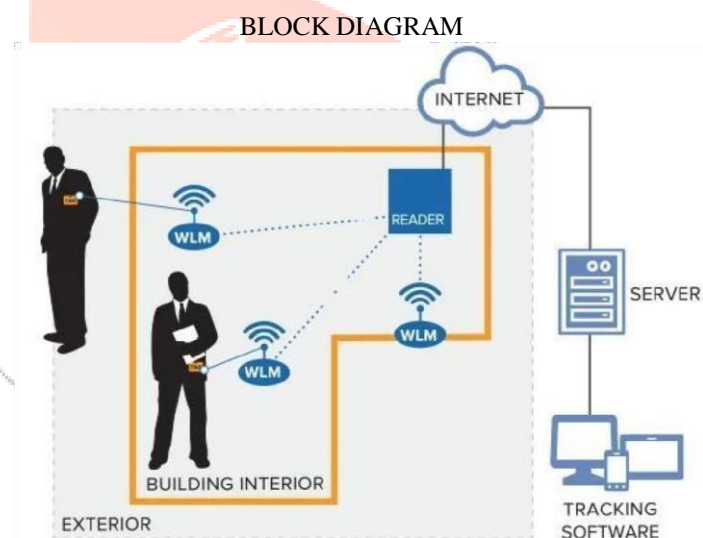


Figure 1 Block diagram

### ARDUINO UNO:

In this system we tend to needed Arduino UNO, controlling By making connection all affiliation properly apply a simple C or C++ code on Arduino sensing element senses to the motion detected in order that it all attentive to user.

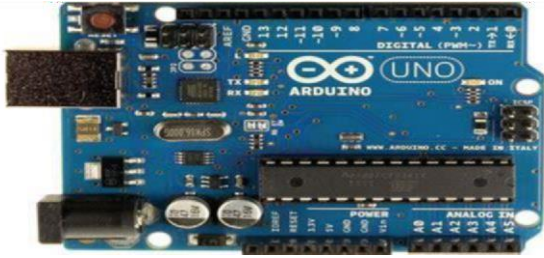


Figure 2- ARDUINO UNO

- Module:



Figure 3 Kit Module

Tags are used in many possible ways. Tags are used in various sectors to expedite checkout, and to prevent various upcoming possible scenarios. A sensor is an equipment used to analyze any of the movement that occurs in the area of a tag by using a light transmitter, often infrared, and a photoelectric receiver.

## II. LITERATURE SURVEY

There are many different methods of implementing RTLS using wireless schemes but they effectively dissolve into two categories: 1) based on the radio signal strength, commonly referred to as Received Signal Strength Indication (RSSI-based scheme), 2) based on the measurement of time, where the time it takes the radio signal to travel between transmitter and receiver is measured (Time-based scheme). For UWB ranging, due to their nature of the inverse relationship of time and frequency, the lifetime of UWB signals is very short. Consequently, the time-based schemes can achieve a far more accurate result than the RSSI-based scheme. Ultra-wide Band (UWB) is a wireless technology developed to transfer data at high rates over very short distances at very low power densities. Ultra-Wide Band short-range radio technology accompanies other long-range radio technologies such as Wi-Fi, Wi-MAX, and cellular wide-area communications. UWB is used to relay data from a host device to other devices in the immediate area (up to 10 m or 30 feet). Has the capacity to carry signals through doors and other barriers that reflect signals at more limited bandwidths and higher power levels.

The Ultra-Wide Band advantages are: (1) Is difficult to stop, because of the wide band; (2) Multipath immunity, reason being low path loss, the low energy density that minimizes interference to other services, the wide frequency band, and the very short pulses; (3) high tolerance to interference if it is properly designed, enabling operation (4) precision, offering real-time, continuous real-time location over short distances; (5) low power, having consumption in the order of microwatts.

## III. METHODOLOGY

With the help of RTLS using ultra-wideband (UWB), you can keep track of employees in real-time, analyze their movement and ensure their safety. The system will consist of two components. One will be hardware and the other will be software. Hardware has anchors, tags, and gateways. The software will be the source of communication of the user with the system. The system works as follows:

Each employee will be referred to as a UWB tag. These tags will be active for specific partitions done virtually in the software itself. Each job will have its partition and UWB tags will be considered active in those regions only. The active time of the tags will be calculated and thus will give the time frame of the job. As jobs are done by a team of employees, a team will be given a task by a supervisor. The timestamp will be recorded at the time of the assignment.

Tags will be active in the active regions only and each tag will be monitored individually. As soon as an employee enters the active region, the tag will be active and the time for which a tag remains active will be considered as the working time of that particular employee.

If an employee leaves the active region, the time clock will be stopped and will be continued if the tag returns to the region.

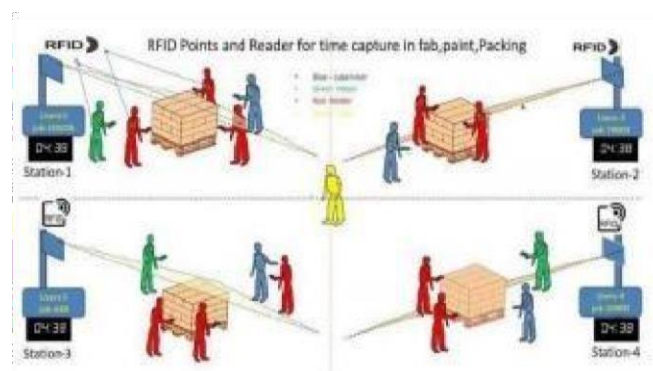


Figure 4 Scanner Design

#### IV CHALLENGES

There are no possible successful projects without challenges. Being a manufacturing industry, it is not possible to make physical boundaries or restrict the passage for in and out of the employees.

#### V. VIRTUAL BOUNDARIES:

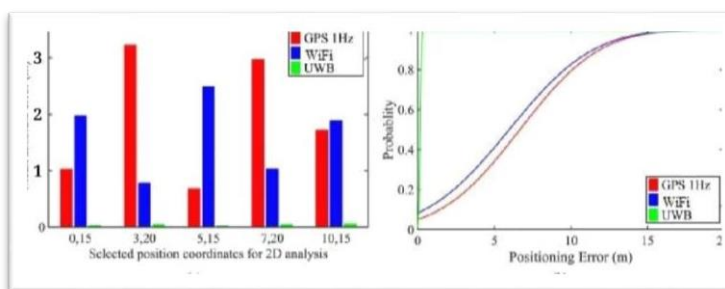
A virtual boundary is a good solution for this particular problem. To have virtual boundaries we need a way to represent the floor in such a way that, the boundaries that are in the software can also be applied in the real world. We can solve this problem using the coordinate system and the zone logic. First, we will represent the floor in terms of grids. Each grid will hold its respective position of Working stations on the floor. We can bound the tags in between these grids that need to be flow and follow and adopt the changes.

#### VI. RESULTS

From the following case study that was attempted and studied it was clear that UWB results in least number of error and most accurate result in tracking the location Here is the outcome of the studies:

Technology	Identification	Accuracy	Presence Detection	Positioning type	Power Consumption	Range (m)
Ultra Wideband	✓	cm - dm	✓	Absolute	Low	1 - 50
Wi-Fi	✓	m	✓	Absolute	High	1 - 50
Bluetooth	✓	m	✓	Absolute	Low	1 - 20
RFID	✓	dm - m	✓	Absolute	Low	1 - 50

Table 1 Comparison and resultant table



Graph 1 Performance and accuracy

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#### VIII. CONCLUSION

This system is designed to automate employee tracking and calculating employee efficiency. With the help of UWB Technology, the system will monitor every worker in the industry and will send the status of the workers after a specific period. The system will keep a record of every employee and calculate their efficiency. With this framework, it is considerably simpler to discover the situation of each worker inside the industry premises. It sees the worker's points of interest and their exercise. The overall research is the automation and digitalization in the industry. A smart way for effective production and industrial growth.

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