

POSITIONNING SYSTEMS: TECHNIQUES AND APPLICATIONS

MASTER1-SEM2(IOT)

Submitted by Submitted to

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INTRODUCTION

A positioning system is a technological framework designed to ascertain the precise location of objects, people, or devices within a given space. It relies on various technologies and methodologies to determine and communicate the geographical coordinates of the subject. Traditionally, Global Positioning System (GPS) has been widely utilized for outdoor positioning, offering accurate location data through satellite signals.

In contrast, an Indoor Positioning System (IPS) is tailored for environments where GPS signals may be limited or nonexistent. IPS functions as an 'Indoor GPS,' employing a network of devices to enable accurate tracking and location services within enclosed spaces. This technology is particularly valuable in large indoor areas such as shopping malls, airports, hospitals, and other structures, where traditional GPS signals may struggle to provide precise positioning information. Utilizing IPS, individuals can navigate indoor spaces seamlessly, enhancing user experiences and providing valuable insights for various applications, ranging from way finding to emergency response scenarios. The demand for IPS has risen significantly, recognizing its importance in delivering accurate and reliable location services where outdoor positioning systems may fall short. (mokosmart, 2024)

A diagram of a factory

Description automatically generated

Figure 1:Indoor positioning system

There are several issues with the positning system which need to be address to effectilely run the system.

**Limited Signal Coverage:** Indoor spaces have weaker GPS signals, impacting the accuracy of IPS.

**Multipath Interference:** Reflective surfaces in buildings create signal interference, leading to inaccuracies.

**Infrastructure Costs:** Implementing IPS may require significant investments in hardware and infrastructure.

**Privacy Concerns:** Tracking individuals indoors raises privacy concerns that need to be addressed.

**Device Compatibility:** Ensuring compatibility across various devices and platforms is crucial for widespread adoption.

With this module we will learn and explore few tedchniques and algorithms to effecitely design a solutions .

# Markov Model usefull for anonymisation and for prediction (positioning and action)

INTRDOUCTION

A Markov Model is a probabilistic model employed to represent systems with random transitions, assuming that the likelihood of future states is solely dependent on the current state and not influenced by preceding events. This characteristic, termed the Markov property or memory lessness, makes these models valuable in statistical modeling, offering a means to forecast the dynamics of systems adhering to this property (deepai, 2024).

The fundamental elements of a Markov Model involve the notions of states and transitions. States signify potential system conditions, and transitions denote shifts from one state to another. The probabilities dictating these transitions are established through historical data or expert insights.

Markov model could be based on the open or hidden based on the parameters available.

A diagram of a diagram

Description automatically generated

Figure 2:Example of hidden markov model

Illustration (Background)

Use case and scenario

CONCEPTION

CLASS DIAGRAM

IMPLEMENTATION

PROBABLITY MAP

ALGORITHMS

GITHUB

SCREENSHOTS

TESTING

ANALYSIS

## N‐Lateration .

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