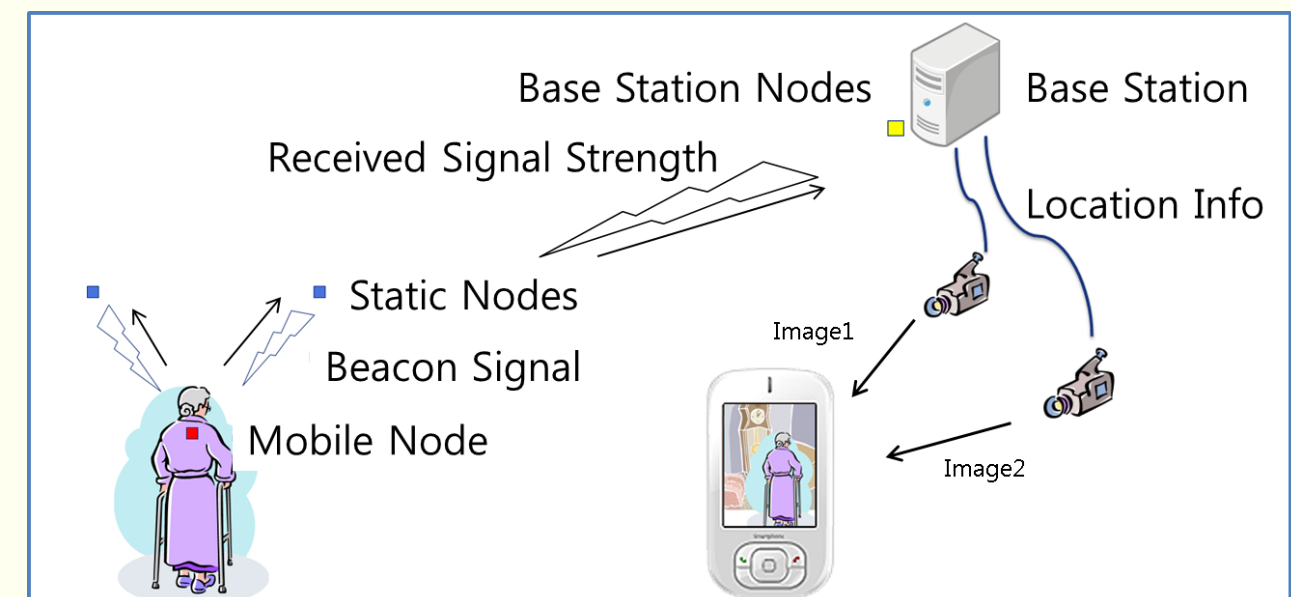


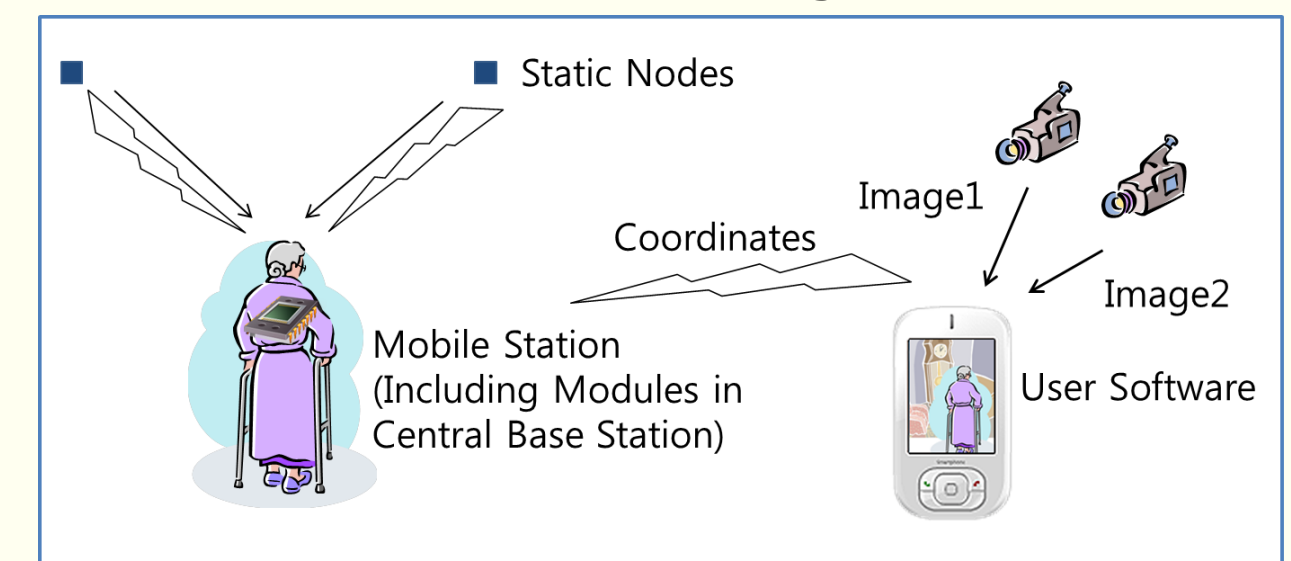
Proactive Camera Tracking System Using USN(Ubiquitous Sensor Node) with Zigbee Communication

Objectives

- **Designing A System for Tracking Target Objects Through Cameras**
 - For Limited Space
 - Economical Setup and Maintenance Cost
 - Supporting Multiple Targets
 - Recording Targets' Images from Cameras
- **Designing SoC for This System Which Can be Attached to Targets As Mobile Stations**



A Model of Location Estimation using Central Base Station



A Model of Location Estimation using Self-Calculation on Mobile Station on SoC

Tracking Algorithm

- **Location Estimation Algorithm**

$$\sum_{i=1}^N \frac{R_i}{D_i^2} \rightarrow \sum_{i=1}^N \frac{(R_i + 30)^2}{D_i^2}$$

- **Filtering Algorithm**

$$\begin{cases} R_{next} = (1 - C_1) \times R_{old} + C_1 \times R_{new} & (|R_{old} - R_{next}| < T_1) \\ R_{next} = (1 - C_2) \times R_{old} + C_2 \times R_{new} & (|R_{old} - R_{next}| < T_2) \\ R_{next} = (1 - C_3) \times R_{old} + C_3 \times R_{new} & (|R_{old} - R_{next}| > T_2) \end{cases}$$

- **Smoothing Algorithm**

$$\begin{cases} X_{next} = (1 - C) \times X_{old} + C \times X_{new} \\ Y_{next} = (1 - C) \times Y_{old} + C \times Y_{new} \end{cases}$$

System Outline

① Sensor Network

- Collects RSS (Received Signal Strength) Information
- Consists of Mobile Nodes, Static Nodes, Base Station Nodes

② Light Base Station

- Receives Coordinates and Selects Camera and Sends Image
- Manages Communication between Multiple Sub Systems

③ Mobile Station (on Versatile Board)

- Receives RSS Array and Estimates Coordinates of Mobile Node using HW, SW Logic
- Sends Coordinates to Light Base Station

Effectiveness

- **Portability** – Continuously Tracks location when Sensor Networks are Changed
- **Efficiency** – Operates with Low Power
- **Privacy** – Coordinates are Kept in Secret
- **Scalability** – Supports Large Number of Tracking Targets Without Congestion and Computation Bottleneck
- **Independency** – Operates Without Support of External Processing Units

