A Wireless Sensor Network (WSN) Model for Reconnaissance and surveillance of Remote Environments using Extended Kalman Filter (EKF) and FastSLAM for Military and Defence Applications.

Ashish Jacob Sam  
Dept. of CSE  
ASETAmity University Mumbai  
[ashishjacobsam@gmail.com](mailto:ashishjacobsam@gmail.com)

Chaitanya V Mahamuni  
Dept. of ECE  
ASETAmity University Mumbai  
[chaitanyamahamuni91@gmail.com](mailto:chaitanyamahamuni91@gmail.com)

*Abstract*—One of the many requirements for a military assignments is to **scout** a given area before proceeding to mission. This work is also referred to as reconnaissance and is performed by highly trained soldiers. Making a map of the area is the basic task they perform. It is crucial that this information is **highly reliable and accurate. Another major need of the military is to implement real-time surveillance, especially in forests and specified indoor places where aerial surveillance is not helpful.** This paper aims to describe **an IoT based approach** with which several unmanned rovers can be used to **scout** a given area, as well as perform real-time surveillance. This paper concludes how a clear mapping of the area can be done, along with the effective advantages and disadvantages offered by this approach.

Keywords—Reconnaissance, ***military***, ***defense***, ***WSN***, ***mapping***, ***SLAM***

# Introduction

In military operations, reconnaissance or scouting is the exploration outside an area occupied by friendly forces to gain information about natural features and other activities in the area.

Examples of reconnaissance include patrolling by troops (skirmishers, long-range reconnaissance patrol, U.S. Army Rangers, cavalry scouts, or military intelligence specialists), ships or submarines, manned or unmanned reconnaissance aircraft, satellites, or by setting up observation posts. Espionage normally is not reconnaissance, because reconnaissance is a military's special forces operating ahead of its main forces; spies are non-combatants operating behind enemy lines.

Reconnaissance conducted by ground forces includes special reconnaissance, armored reconnaissance, amphibious reconnaissance and civil reconnaissance.

Aerial reconnaissance is reconnaissance carried out by aircraft (of all types including balloons and unmanned aircraft). The purpose is to survey weather conditions, map terrain, and may include military purposes such as observing tangible structures, particular areas, and movement of enemy forces.

Naval forces use aerial and satellite reconnaissance to observe enemy forces. Navies also undertake hydrographic surveys and intelligence gathering.

Reconnaissance satellites provide military commanders with photographs of enemy forces and other intelligence. Military forces also use geographical and meteorological information from Earth observation satellites.

Types of reconnaissance:

* Terrain-oriented reconnaissance is a survey of the terrain (its features, weather, and other natural observations).
* Force-oriented reconnaissance focuses on the enemy forces (number, equipment, activities, disposition etc.) and may include target acquisition.
* Civil-oriented reconnaissance focuses on the civil dimension of the battlespace (areas, structures, capabilities, organizations, people and events abbreviated ASCOPE).

The techniques and objectives are not mutually exclusive; it is up to the commander whether they are carried out separately or by the same unit.