METU, Department Of Computer Engineering

Graduation Project
Proposal Form

Project Information

Title

Search and Rescue System

Target

Public [ ] Restricted [X]

The project can be given only one group and group members are planned to be employed as Engineer Candidates to ASELSAN's Command Control Software Design Department. Due to ASELSAN's Engineer Candidate Employment criterias, applicants must have a CGPA >= 3.0.

Proposer Information

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IP (Intellectual Property) Information

Only ASELSAN has the rights to use of any project output in their products or systems with commercial purposes without having any restriction. The other parties can use the outputs only for academic purposes.

Project Description and Background Information

Description

In this project, a system that will be used in Search & Rescue operations will be designed and its software components will be implemented. Main components of the system are:

- Mission Planning and Coordination Center
- Rescue Team Member Computers
- Rescue Team Member Smart Glasses
- Unmanned Reconnaisance Vehicle(Quadcopter)

S&R System is used for planning and executing missions that are aimed to find and rescue people who are lost or injured in the field. It consists of some subsystems which are used in mission planning, tracking and execution of the rescue missions.

A rescue mission is planned in computer at Mission Planning and Coordination Center. During planning phase, last known position and estimated position of lost person, digital maps of field, rescue team's information etc.. are used as an input. Mission will be planned in Planning & Coordination Center by using a computer having internet access and after planning has been completed, necessary information will be loaded to devices that is going to be used by rescue team.

When mission starts, everyone in the rescue team will be able to see their planned route on the mission computers and on the smart glasses. Also they will be able to see their position and everyone else's position on their devices.

Information on the smart glasses will be presented using augmented reality technology. Information on the computers and smart phones will be presented in two ways; by augmented reality technology over device's camera view and by placing information on digital maps.

If needed, rescue team will be able to use quadcopter for reconnaissance and the video taken by camera of quadcopter will be transferred to smart glass and/or mission computers.

Everyone in the rescue team will be able to contact to each other by text messages or by talking using VoIP technology. They will also be able to transfer their device's video streams to each others when they have been asked.

Everyone in the rescue team will be wearing pulse sensors. Everyone's health information will be displayed on mission computers and planning center by using these pulse sensors' information. This information will also be shared among team members' computers. Also, the actions (walking, sitting, running, etc..) of members during the mission will be shown on the mission computers.

During the mission, execution of the rescue operation can be monitored by the mission center. All the positions of rescue members, health states and their actions will be shown on the Planning Software using Geographical Information System. If needed, a member will be requested to transfer his video image to the center and watched from there.

If a member finds the lost person from a distance, he will be able to measure the distance with laser range finder and compute his geographic coordinate. Then he is going to be able to mark his position and inform the other members and planning center.

When the lost person is found during the mission, rescue team will put a pulse sensor to the person and person's health status will also be shown in all mission computers and in mission planning center up to rescue operation completed.

Similar Products/Projects

Information about Search & Rescue Systems can be found on the internet widely. However, this system is going to be the first Search & Rescue System using Augmented Reality, sensor technologies and quadcopters.

Justification of the proposal

The purpose of this project is to design and develop a Search & Rescue System using several new hardware and software technologies.

Rescue missions are hard and critical missions. Using new hardware and software technologies, is going to increase the team coordination, effectiveness of plan executions and so the chance of mission success. By the use of these technologies, members of rescue team will have the necessary information about whole plan before operation, team member's actions and health states during the plan execution and any information created by team members during the operation. Besides, they will be able to share information they have, respond to the changes very quickly, and coordinate better during the execution of rescue missions.

By this project we are planning to achieve following benefits

-Solving the coordination problems of search & rescue teams

- Increase the local reconnaissance abilities during the operations
- Team members' ability to respond to changes in the mission

Contributions, Innovation and Originality Aspects of the Project

Many classical command and control operations like S&R use conventional technologies like GIS, GPS and so on. In this project, some new sensors and augmented reality technologies is going to be used in order to increase the situational awareness of the rescue teams. Team members will not only be aware of field information but also be aware of all team member's actions and health states too. This is going to increase the coordination of team members, decrease the possibility of risk

Usage of following technologies will differentiate our product from conventional ones

Augmented reality

Quadcopters

Smart Phones

Sensors

Targeted product is going to provide greater situational awareness from the conventional ones.

Usage of augmented reality, unmanned vehicles and some sensor technologies, is going to be first in this area.

Usage of mentioned technologies can later be used in similar command and control operations.

Technical Aspects of the Project

In the project there will be several software applications running on PC, tablet pc, smart phones and smart glasses. The desktop application running on PC will have the capability of planning a rescue mission and tracking this mission during execution. This application will be a java application using GIS component. Each team member will have his/her own rescue equipment(tablet pc, smart phone, smart glasses, and sensors) . These equipments will be used during execution of rescue missions by following purposes;

- to communicate
- to create information
- to share information
- to be able to aware about execution of mission

All equipments will have Android OS and applications working on these devices are going to be android applications.
Communication between rescue equipments and desktop computer is going to be wireless(WiFi, 3G/LTE).

Targeted Output, Targeted User/Domain Profile

At the end, there will be several software application running on smart phones, tablet computers, smart glasses and desktop computers which are operating a search & rescue mission interactively. Mission plan will be loaded to them from a notebook and after that, they will show information to the user. If needed, the camera images will be transferred to each other and to mission planning center.

Project is going to be accepted as successful if the following goals are achieved
- All software components are installed to devices and working properly
- Mission plan can be loaded to devices from planning computer
- Augmented Reality technology can be used at least one of the rescue equipments properly
- Transfer of live video is achieved from quadcopter to any rescue equipment or center computer
- All members' information is shown in all of the rescue equipments and central computer
- Every team member is able to see other members' information in his computer
- Team members are able to communicate with each other over SMS or VoIP

At the end of the project Rescue teams can utilize this product for their rescue missions.

Project Development Environment

HW
Desktop/Laptop Computer
Smart Phones and Tablet PCs with Android OS
Smart Glasses with Android OS
Several Sensors(action, pulse, LRF,IR, FLIR cameras etc.)

SW
Augmented Reality
Geographic Information Systems
VoIP

OS
Windows
Android

Programming Language & Development Environment
Eclipse Java
Android SDK

METHODOLOGY
Object Oriented Design Methodology
Agile SW Development Methods are preferred

External Support

SW and HW requirements of the project are listed in previous section.

All the needed SW and HW will be provided by ASELSAN.

ASELSAN is going to support the project with two software engineers for consulting the team and reviewing the project outputs.

References

Nope