This work derives from the 2011 Singapore KAI Square Mobile Platform Development Challenge. My friend and I built a team and joined the competition.

Team Name: Spring.

Team Member: LIU Hongbin (me, liuhongbin2007@gmail.com)

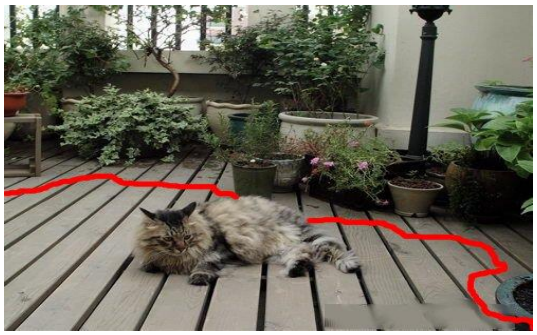
ZHANG Renyu (my friend, zhangrenyutj@gmail.com)

Team Object: Get a new practical idea, implement it and win the award.

(During the stages of idea proposing, system design and implementation, we shared the tears and joys.)

Our Idea:

Home care focused on intrusion detection.



Scene1

Keeping pets away from garden plants:

When the pet steps across the red alarming line, our system will remind the owner that somebody would damage the garden.

Scene2

Automatic noticing new comers:

When a person walks into the red square region, our system will tell owner that a visitor is coming.

Scene3

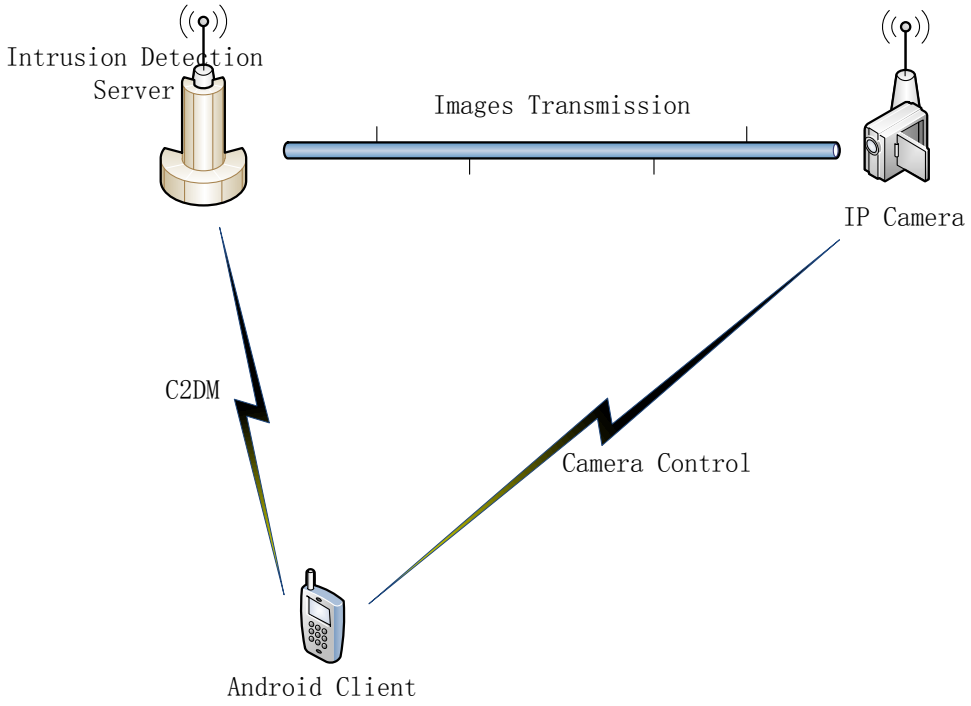
Car locking and tracking:

The red circle acts as an invisible lock. When the car is moved abnormally, our system will notice the owner and keep tracking the car.

Challenge & Solution in idea creating:

In the challenge, participants were asked to integrate KAI Square's IP Camera with Mobile Platform and implement brilliant ideas. We did brainstorming and proposed several ideas, such as landscape synthesizing, office monitoring, home care, parking lot monitoring, etc. We reached an agreement that the idea should be brand new and focusing on a practical point. However, after 3 hours' discussion, we couldn't agree on the final decision: home care or parking lot monitoring. To decide the finial idea, we draw both ideas on the white board and wrote down the advantages and disadvantages. Finally, home care focused on intrusion detection was chosen. We named it Spring Mobile Security System (SMSS).

System Design:

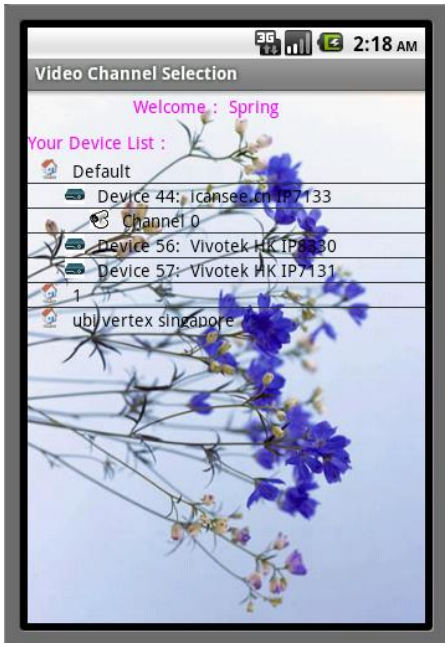


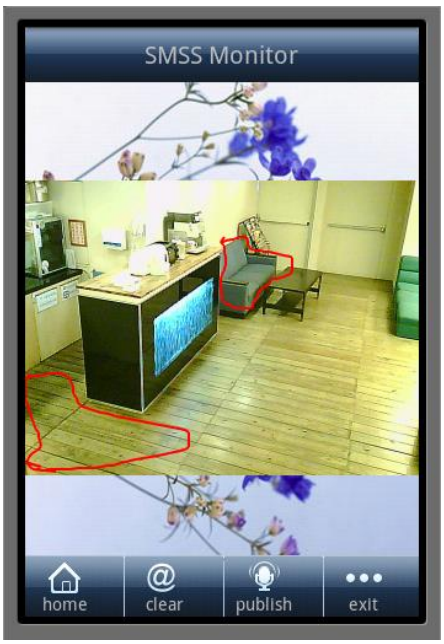
Implementation:

Based on newly born 3G mobile platform and the cutting edge IP Camera of KAI Square, SMSS integrating the widely spread cloud computing, provides mobile monitoring and cloud security services, which far surpasses traditional video monitoring systems.

We run the client on Android platform and the server on Google App Engine. Alarming message is pushed from server to mobile client with Android Cloud to Device Messaging (C2DM).

Client interfaces:





SMSS provides the following functions:

I. Convenient IP Camera management
II. Basic real time scene viewing and monitoring
III. Easy security region selection
IV. Efficient selected region intrusion detection
V. Efficient motion tracking focused on selected objects
VI. Real time alarming and noticing

Challenge & Solution in implementation:

Challenge 1： This was the first time for us to develop Android apps. Although we had experience in Java programming, we were green hand in Android framework. To quickly startup, we contacted the TJU Free Software Foundation in our university, since there has an Android developing team. The senior members gave us direct instruction, and recommended us several useful books.

Challenge 2： The challenge organizer only provided us a few IP Camera addresses and a simple API specification. It was hard for us to get the images and control the camera correctly. We tried several methods but failed. To conquer the problem, we scanned email address of technical engineers from the homepage of KAI Square Pte Ltd. They gave us more detailed usage of the APIs.

Here, I'd like to express my appreciation for their kind helps.

Challenge 3： To improve the intrusion detection accuracy, we took more than 2 weeks to study image processing and some basic computer vision knowledge. We introduced noise filtering, object segmentation and motion tracking into the system. Also, we defined a region change function. What excited us was the accuracy increased more than 20%, compared with simple region subtraction.

Results

At final, we integrated the IP Camera onto Android platform for home care. The intrusion detection accuracy approached 90%. We got the team third prize of 2011 Singapore KaiSquare Android Platform Development Challenge.

During the three months, I learned how to develop Android apps, do image processing on Google App Engine in python, and got a good understanding of C2DM framework.

The most important thing is we implemented our idea. Our friendship was strengthened in the cooperation.