# Specification of Requirements

Project Kitchen Occupation

TSBB11 HT 2013

Version 0.1


Status

| | | |
|---|---|---|
| Reviewed | – | 2013–09–24 |
| Approved | | |

**2013–09–24**

# Project Kitchen Occupation

Bilder och Grafik CDIO, HT 2013
Department of Electrical Engineering (ISY), Linköping University

## Participants


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# Contents

# List of Figures

# Document history

| Version | Date | Changes | Sign | Reviewed |
|---|---|---|---|---|
| 0.1 | 2013–09–09 | Initial draft | MS | |
| 1.0 | 2013–09–24 | Final Document | All | |
| | | | | |

# 1 Introduction

There exist many places in society where the degree of human occupancy and movement flow is desirable to know as basis for decision making. Examples of such situations are weather there are enough of a certain type of room, which part of a store that attracts most people or even the variation of flow of people through doors or entrées. Such data answers e.g. if it is necessary to build more rooms and helps understanding user or consumer patterns. It provides vast opportunities in resource management, marketing, sales and scheduling. There exist some plausible solutions to estimating the number of people at a location such as using cell phones or motion detectors, but this project aims at a image based approach with the possible benefits of being both cheaper and more robust.

## 1.1 Background

Today Linköping University have many places with similar functionality and among them are for example student kitchens, where students are provided with the ability to warm food brought with them. Linköping University have several such kitchens all over its campuses. Critics claim that there are too few student kitchens with microwave ovens and that the existing ones usually are overcrowded. That all kitchens are overcrowded at the same time have not been confirmed by sample inspections and one standing hypothesis is that students don't know where all the kitchens are nor that they want to risk going to a kitchen in another building in case that is full as well.

The aim is that the result of this project will be used to provide all students with the means of visualising the crowdedness of each kitchen, providing them with the means of finding the closest, least occupied kitchen available.

## 1.2 Involved Parties

Three parties are involved:

- Liu IT, the Division for IT servidces at Linköping University.
- Computer Vision Laboratory, Department of Electrical Engineering, Linköping University.
- A group av students taking the course TSBB11 2013, listed in the *Participants* table, page (ii).

### 1.2.1 Customer

Liu IT, represented by Joakim Nejdeby, CIO at Linköping University.

### 1.2.2 Supervisor

Ph.D Fahad Khan at the Computer Vision Laboratory, Department of Electrical Engineering, Linköping University.

## 1.3 About this document

This document contain the requirements of the project. It is divided into different modules or aspects, each with further subdivisions, all containing explanatory text and functional requirements. Each functional requirement is placed in a table of the form showed below.

| Req. | Description | Type |
|---|---|---|

### 1.3.1 Requirement priorities

Each requirement has three different priority levels (Type), the meaning of each one is presented below:

1. Priority level one constitutes a mandatory requirement, meaning this feature has to be fulfilled by at the time specified ion the description. If no time is specified, the requirement has to be fulfilled by the time of the final delivery (see section 8).
2. A requirement with priority level two is a requirement to be met if extra time is available.
3. A level three requirement is more of a suggestion on how to improve the system even further after the final delivery.

## 1.4 Definitions

Text here.

# 2 System Overview

Text here.

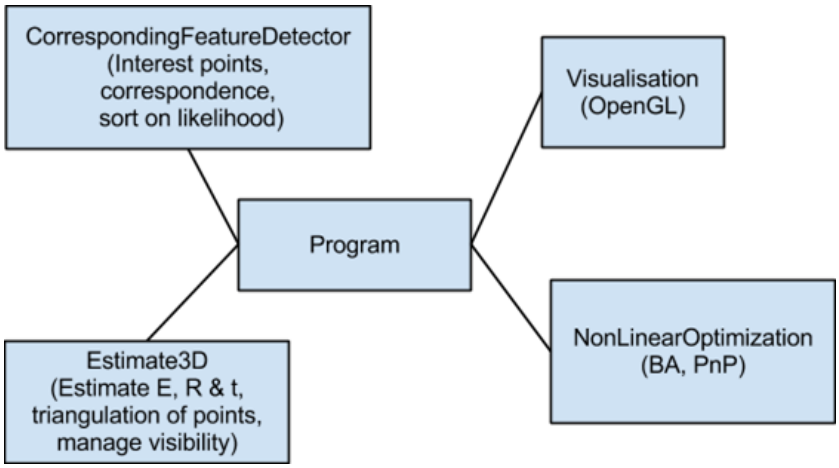


Figure 2.1: *Modules of the system(Example image)*

## 2.1 Rough description of the system

Text here.

## 2.2 Components

Text here.

## 2.3 Dependencies

Text here.

## 2.4 Design Philosophy

Text here.

## 2.5 General Requirements

| Req. | Description | Type |
|---|---|---|
| **2.1** | The main purpose of the system is to monitor the usage intensity of a room or building | **1** |
| **2.2** | The system operates using cameras | **1** |
| **2.3** | Data from each camera is forwarded to a server on which the processing takes place (several cameras, one computer) | **1** |

# 3 Hardware

Text about this part of the system

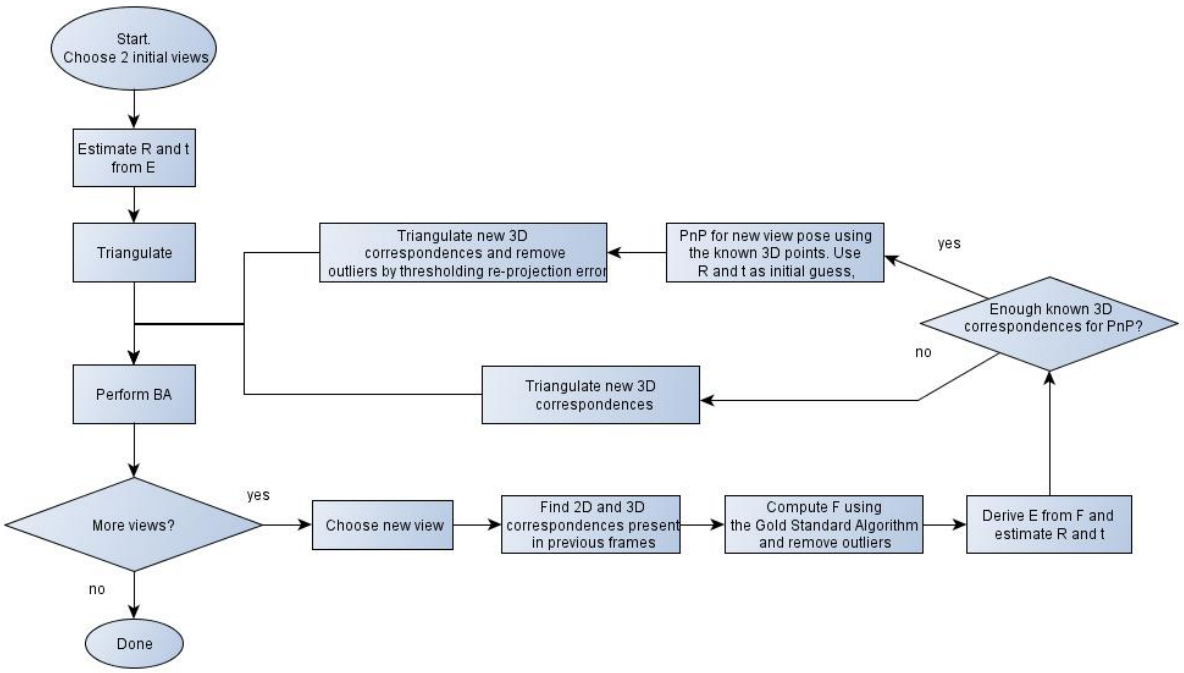


Figure 3.1: *Data flow between modules.(example image)*

## 3.1 Description

Text here

## 3.2 External frameworks/interfaces

Text here

## 3.3 Limitations

Text here

## 3.4 Hardware Requirements

| Req. | Description | Type |
|---|---|---|
| **3.1** | The system uses network cameras powered via ethernet | **1** |
| **3.2** | The system can operate using high resolution (>1 Mpixel) cameras | **1** |
| **3.3** | Lower resolution cameras can be used | **2** |
| **3.4** | A minimum of 1 camera per entrance is required | **1** |
| **3.5** | Each camera can cover more than one entrance | **2** |

# 4 Software

Text about tsoftware

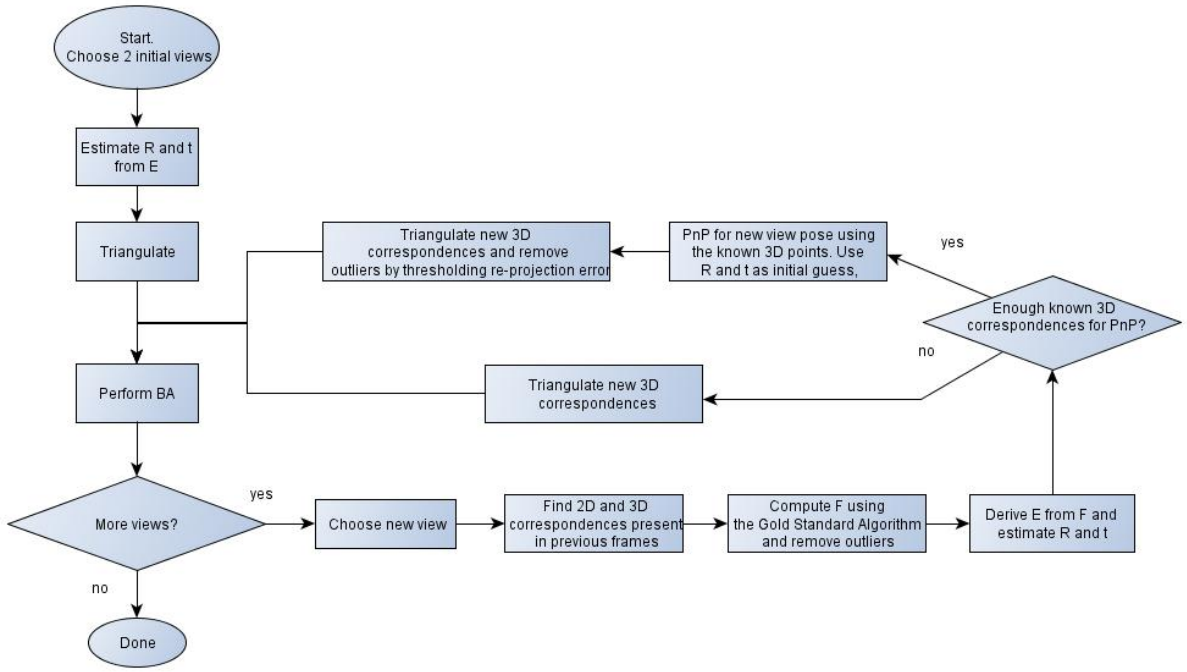


Figure 4.1: *Data flow between modules.(example image)*

## 4.1 Description

Text here

## 4.2 External frameworks/interfaces

Text here

## 4.3 Compatibility

Text here

## 4.4 Limitations

Text here

## 4.5 Software Requirements

| Req. | Description | Type |
|---|---|---|
| **4.1** | The system operates on Windows and OSX platforms | **1** |
| **4.2** | The system is modular with respect to the camera manufacturer and/or network API | **1** |

# 5 Performance

Text about performance.

## 5.1 Description

Text here

## 5.2 Reliability

Text here

## 5.3 Quality control

Text about testing and stuff

## 5.4 Performance requirements

The requirements listed in the table below all assume one camera per room entrance, if each camera is required to monitor more than one entrance, the type of each requirement is incremented by one (Type 1 becomes type 2 etc.).

| Req. | Description | Type |
|---|---|---|
| **5.1** | The system is able to count the number of people entering or leaving the room, thereby knowing the number of persons currently in the room. | **1** |
| **5.2** | The system knows if there is a queue to enter the room | **1** |
| **5.3** | A rough estimate of the queue size/waiting time is presented | **1** |
| **5.4** | A more accurate estimate of the queue size and/or wait time is provided by using mathematical models | **2** |

# 6 Usage and Installation

Text about usage.

## 6.1 Description

Text here

## 6.2 Installation

Text here

## 6.3 Maintenance

Text here

## 6.4 Continued development

Text here

## 6.5 Operational requirements

| Req. | Description | Type |
|---|---|---|
| **6.1** | The installation proses requires a short manual and no knowledge about advanced computer vision | **1** |
| **6.2** | Calibration of the system is performed via a calibration program | **1** |
| **6.3** | The system is self-calibrating | **2** |
| **6.4** | Software for adding new cameras and/or rooms is provided with the system. | **1** |
| **6.5** | Results are presented on the project group webpage | **1** |
| **6.6** | System is avaliable as an App on AppStore/Android Market | **3** |

# 7 Documentation

Text about the documentation.

## 7.1 System view

Text here

## 7.2 Project plan

Text here

## 7.3 User's manual

Text here

## 7.4 Weekly status reports

Text here

## 7.5 Technical report

Text here

## 7.6 Documentation Requirements

| Req. | Description | Type |
|---|---|---|
| **7.1** | The system view has to be approved by the customer before development starts | **1** |
| **7.2** | A project plan providing an outline of responsibilities and development methods has to be presented to the supervisor | **1** |
| **7.3** | Weekly status reports are to be delivered via e-mail to customer and supervisor | **1** |
| **7.4** | At the end of the project a technical report is delivered to the customed and course examiner | **1** |
| **7.5** | A user's manual will be delivered with the technical report | **1** |

# 8 Delivery

Text about the different deliveries and deadlines...

## 8.1 Mid-term checkpoint

A system that manages ..? is delivered.

## 8.2 Final delivery

A system that manages ..? and fulfil at least the type 1 requirements stated in this document.

## 8.3 Delivery dates

| | |
|---|---|
| This document | **2013-09-24** |
| Project plan | **2013-09-24** |
| System view | **2013-09-24** |
| Weekly progress | **Mondays** |
| Mid-term progress report | **2013-11-04** |
| Final product | **2013-12-13** |
| Technical report | **2013-12-13** |
| User's manual | **2013-12-13** |
| Final presentation | **2013-12-19** |

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