

Software Requirements Specification (SRS) for Image Processing Project

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Change History

Version	Date	Author	Changes
1.0	July 20, 2015	Roberto Julianto K	initial version

Chapter 1

INTRODUCTION

1.1.Purpose

This SRS describe the requirements and specifications of the Image Processing Project. The purpose of this project is to estimate gestational age and fetal weight of the ultrasound image processing by using Crown Rump Length (CRL) and Gestational Sac (GS).

1.2.Scope

The project is intended to estimate the gestational age and weight based on CRL and GS. It is implemented from morphology and segmentation operation of Image Processing. The goal is the number that represent the gestational age and fetal weight.

1.3.Definitions, Acronyms, and Abbreviations

1.3.1. Gestational Age (GA)

1.3.2. Fetal Weight (FW)

1.3.3. Crown Rump Length (CRL)

CRL is the measurement of the length of human embryos and fetuses from the top of the head (crown) to the bottom of the buttocks (rump). It is typically determined from ultrasound imagery and can be used to estimate gestational age.

1.3.4. Gestational Sac (GS)

GS is the large cavity of fluid surrounding the embryo.

1.4.References

1. Gonzales, Rafael C. Woods, Richard E. 2008. Digital Image Processing 3rd Edition. USA: Pearson.
2. https://en.wikipedia.org/wiki/Crown-rump_length
3. https://en.wikipedia.org/wiki/Gestational_sac
4. http://www.glowm.com/section_view/heading/Assessment%20of%20Gestational%20Age%20by%20Ultrasound/item/206

1.5.Overview

The rest of the SRS examines the specification of the project in detail. Section 2 of the SRS presents the general factors that affect the project and its requirement, such as user characteristic and constraints. Section 3 outlines the detailed, specific functional, system, and other related requirements of the project. And Section 4 present the software analysis model that will be used as a guide in project.

Chapter 2

GENERAL DESCRIPTION

2.1.Product Perspective

This project will use OpenCV 3.0 as an additional library to perform some operation that related with Image Processing.

2.2.Product Functions

The main purpose of the project is to estimate gestational age and fetal weight from ultrasound image. In this project, the properties that will be used are CRL and GS. The project will applied some image processing theorem, lie Morphology and Image Segmentation.

2.3.User Characteristics

The users of the project will be classified called Observer, who want to know age of pregnancy and the condition of fetal.

2.4.General Constraints

The current constraints on the project are related to the image because it is not obtained directly from USG tool, but image from internet and different image has different image processing method.

Chapter 3

SPECIFIC REQUIREMENTS

3.1.Functional Requirements

This section is organized by the processes of features. The main feature that will be described is find CRL, GS, gestational age, fetal weight.

3.2.Use Cases

3.2.1. Find CRL

3.2.1.1.Introduction

This functional feature will find the length of fetal (described in Section 1.3.3).

3.2.1.2.Inputs

USG Fetal Image – image that contains a fetal that obtained from USG tool.

3.2.1.3.Processing

Described in Pipeline 4.1.

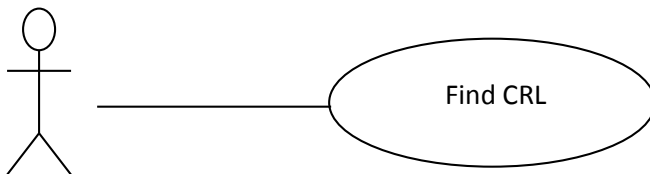
3.2.1.4.Outputs

USG Fetal Image with Line – Input image with line mark that represent CRL.

Length value – Length of fetal as describe in Section 1.3.3.

Coordinates (optional) – Two points that make the longest line into fetal image.

3.2.1.5.Diagram



Observer

3.2.1.6.Scenario

Use Case Name	Find CRL
Trigger	Observer input an USG image
Precondition	USG image is available
Basic Path	<ol style="list-style-type: none">1. The system does filtering and morphology operations.2. The system finds the fetus object.3. The system finds two points that have longest distance.4. The system draws a line between two obtained points.
Post condition	The image is marked with line.

3.2.2. Find GS

3.2.2.1.Introduction

This functional feature will find the length of cavity (described in Section 1.3.4).

3.2.2.2.Inputs

USG Fetal Image – image that contains a fetal that obtained from USG tool.

3.2.2.3.Processing

Described in Pipeline 4.1.

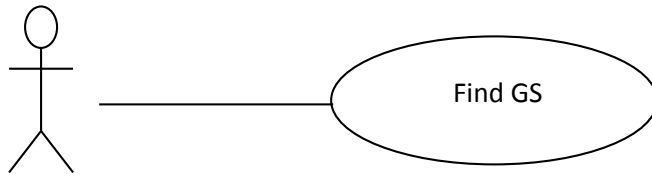
3.2.2.4.Outputs

USG Fetal Image with Line – Input image with line mark that represent CRL.

Length value – Length of fetal as describe in Section 1.3.4.

Coordinates (optional) – Two points that make the longest line into fetal image.

3.2.2.5.Diagram



Observer

3.2.2.6.Scenario

Use Case Name	Find GS
Trigger	Observer input an USG image
Precondition	USG image is available
Basic Path	<ol style="list-style-type: none">1. The system does filtering and morphology operations.2. The system finds the fetus object.3. The system finds the sac object.4. The system finds two points that have longest distance.5. The system draws a line between two obtained points.
Post condition	The image is marked with line.

3.2.3. Find Gestational Age

3.2.3.1.Introduction

This functional feature will estimate gestational age based on CRL or GS

3.2.3.2.Inputs

Length value – a value that obtained from find CRL or GS.

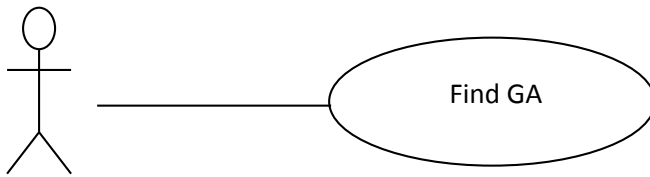
3.2.3.3.Processing

The value will be matched with a table.

3.2.3.4.Outputs

Age – a value that represent Gestational Age

3.2.3.5.Diagram



Observer

3.2.3.6.Scenario

Use Case Name	Find GA
Trigger	USG image with line mark is obtained.
Precondition	CRL or GS scenario has been done.
Basic Path	<ol style="list-style-type: none">1. The system check distance value.2. The system match distance value with value of GA table.3. The system get the GA value.
Post condition	The value of GA is obtained.

3.2.4. Find Fetal Weight

3.2.4.1.Introduction

This functional feature will estimate fetal weight.

3.2.4.2.Inputs

Age – a value that represent Gestational Age.

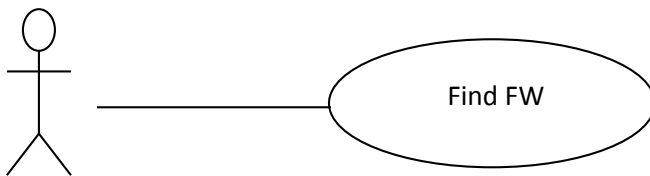
3.2.4.3.Processing

The value will be matched with a table.

3.2.4.4.Outputs

Weight – a value that represent fetal weight.

3.2.4.5.Diagram



Observer

3.2.4.6.Scenario

Use Case Name	Find GA
Trigger	USG image with line mark is obtained.
Precondition	CRL or GS scenario has been done.
Basic Path	1. The system check GA value. 2. The system match GA value with value of FW table. 3. The system get the FW value.
Post condition	The value of FW is obtained.

3.3.Non-Functional Requirements

3.3.1. Performance Requirement

3.3.1.1.Response time

The maximum response for this project is 1 minute.

3.3.1.2.Capacity

The maximum number of image that being in process is 1.

3.3.2. Extendable

The image processing method that will be used is not unique. In other words, there will be a lot of solution can be developed.

3.3.3. Compatibility

The project can be run in machine with x86 and x64 architecture.

3.4.Design Constraints

3.4.1. Software Language

All coding will be done in C++.

3.4.2. IDE

The IDE will be used is Microsoft Visual Studio Professional 2013.

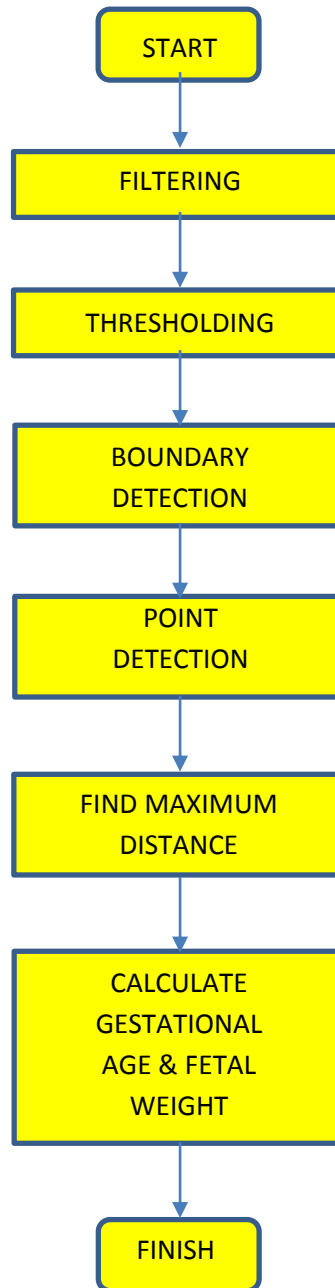
3.4.3. Additional Library

Additional Library will be used in OpenCV 3.0.

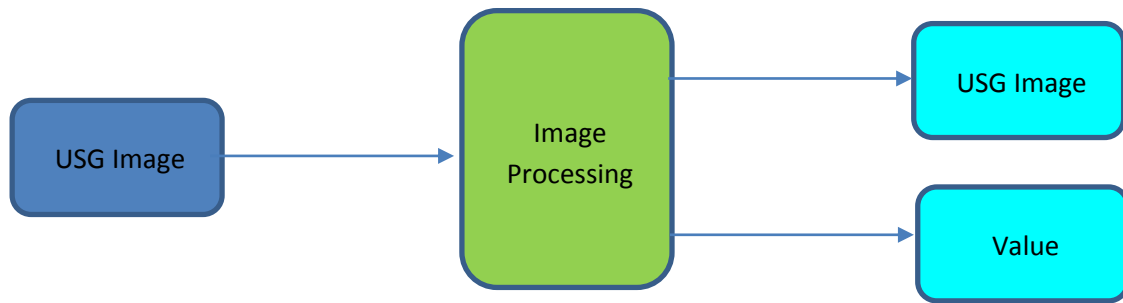
Chapter 4

ANALYSIS MODELS

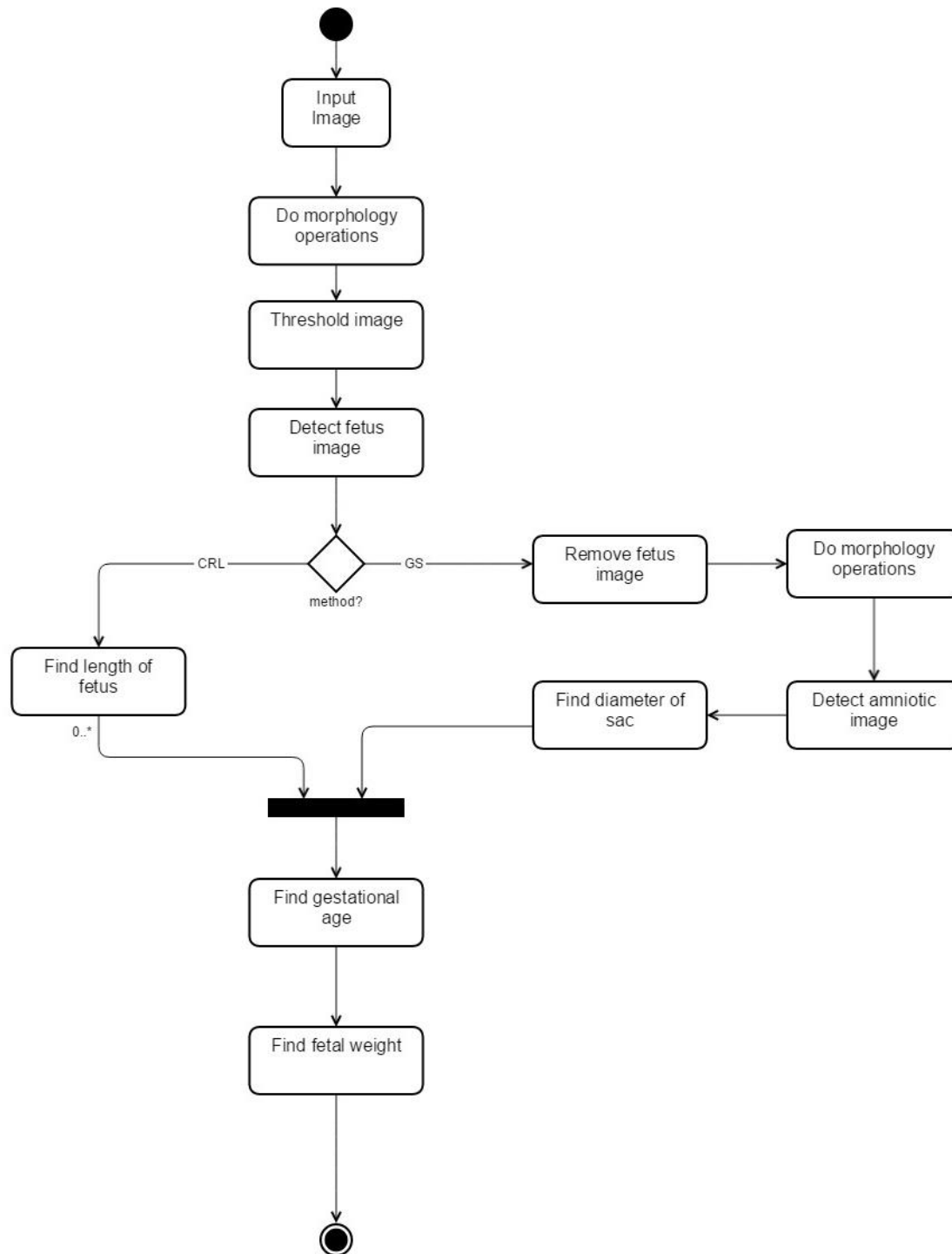
4.1. Pipeline Diagram



4.2. Block Diagram

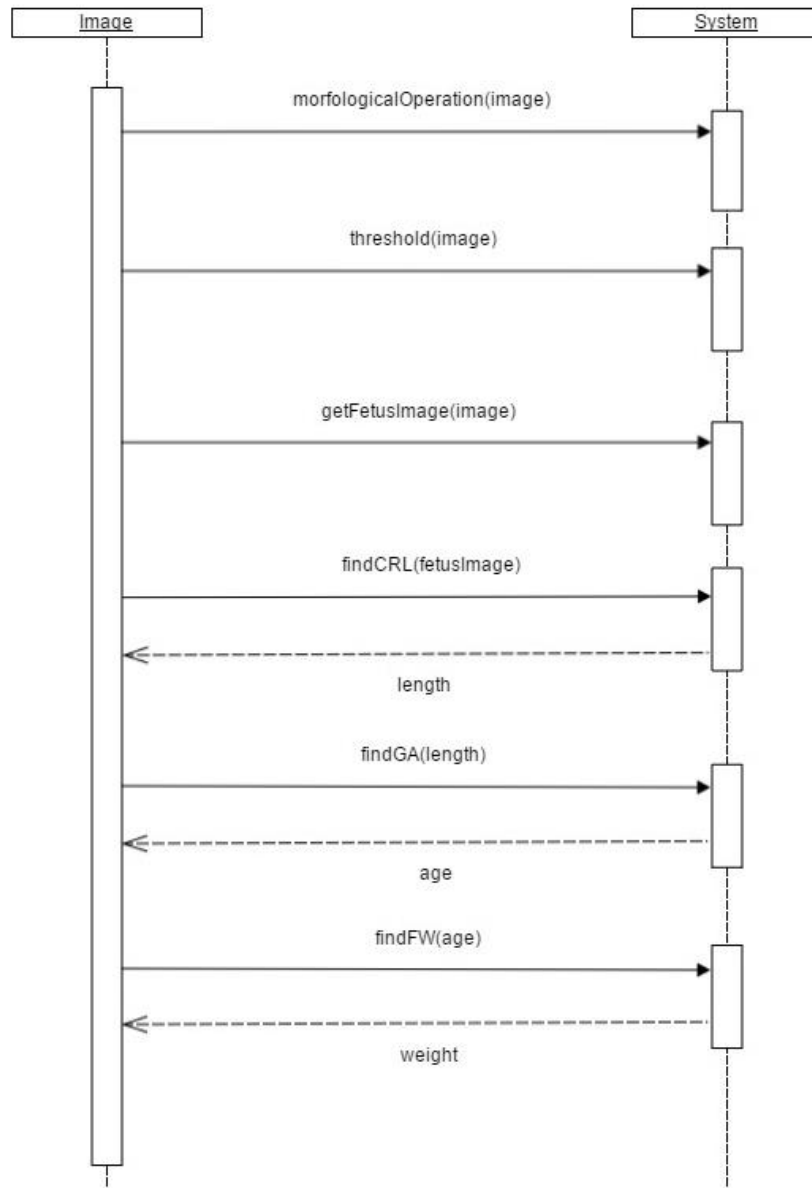


4.3. Activity Diagram



4.4. Sequence Diagram

4.4.1. CRL



4.4.2. GS

