Disaster Monitoring through Georectification of Images without Ground Control Points (GCP) using Multiple Imaging Sensors

Project Report

Group Members' Name

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1. OVERVIEW

1.1 NAME AND ADDRESS OF THE PROJECT MANAGER

a) **Name:**
b) **Organization:**
c) **Address:**
d) **Telephone:**
e) **Fax:**
f) **Email:**

1.2 MAIN FIELDS OF PROJECT

Remote sensing, Image processing, GIS

1.3 NATURE OF PROJECT

Research & Development Work

1.4 CONTACT DETAILS OF SPONSORING & EXECUTING AGENCIES

a) **Sponsoring:**
b) **Execution:**

1.5 PROJECT TEAM

2. PROJECT CHARTER

2.1 SCOPE STATEMENT

The main aim of this research is to provide highly accurate georectfied imagery to time sensitive application such as disaster monitoring by the following objectives:

2.1.1 GEOLOCATING:

To determine the Earth Coordinates of the region of interest in the image.

2.1.2 RECTIFICATION:

To correct the imagery to a map projection in order to remove the distortion in the imagery introduced by the altitude and orientation of satellite and morphology of the Earth.

2.1.3 MAPPING:

To map/overlay the geo-rectified imagery on a geographic map so that direct geo spatial analysis can be performed to locate the area affected by disaster.

2.2 OBJECTIVES

The primary goal of this research is to provide highly accurate geo-rectified imagery using no nground control information to time sensitive applications such as disaster monitoring, as soon as the data is available. This will be accomplished by the following objectives,

1. Develop a mathematical model based on the configurations of multiple imaging sensors to remove the geometric distortions in the imagery.

2. Find the geographic locations of the images on the Earth surface using standard methods and refine them iteratively using DEM.

Validate the complete model by testing it on satellite imagery for proof of concept. Compare the results of the proposed algorithm with the outputs generated by the Surrey Satellite Technology Ltd to quantify the accuracy of the proposed method.

2.3 ROLE AND RESPONSIBILITY MATRIX

Given in table 1 is the role and responsibility matrix. This matrix identifies the role of each member of the project and what are his/her responsibilities.

Table 1: Role and Responsibility Matrix

Responsibility Assignment Matrix			
	Name	Roles	Responsibility
1	Member 1	Principal Investigator	Mathematical Model Development, simulation, validation and testing.
2	Member 2	Project Manager	Project plan, budget management, evaluation and review of progress
3	Member 3	Data Provider	Data Acquisition
4	Member 4	Resource Manager	Organisation of HR, meetings and communication among the team members and purchasing of hardware and specialized software.
5	Member 5	Procurement Manager	Procurement of serve ices outside organization and managing organisation's facilities and equipment.
	Member 6	Designers and Developers	Responsible for designing, developing, validating, change control.
	Member 7	Software Manager	Manage the software package

2.4 CERTIFICATE

1) Certified that the PI, project manager, resource manager, data provider are full time Faculty Members/Foreign Professors/ Eminent Scholars/Eminent Researchers of the University / Degree awarding institutes.

2) Certified that the equipment (specialized software) demanded for the subject project is / are not available in the University / Institute.

3) Certified that NUST will not be responsible for unavailability of data of the region of stake holders interest.

4) Data protection rights will be reserved by NUST.

_____ _____

SIGNATURE OF PRINCIPAL INVESTIGATOR **SIGNATURE OF PROJECT MANAGER**

Date: _____ **Date: _____**

_____ _____

SIGNATURE OF DIRECTOR NDMA **DIRECTOR FINANCE HEC**

(NATIONAL DISASTER MONITORING AUTHORITY) **(HIGHER EDUCATION COMMISSION)**

Date: _____ **Date: _____**

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3. PROJECT PLAN

Project plan gives the work breakdown structure of the project, cost breakdown of the project, network diagram and project schedule.

3.1 WORK BREAKDOWN STRUCTURE

We have developed WBS up to level 3. This WBS is generated in MS Project 2002 and its screen shots are given below. Figure 1 shows the level 1 of WBS. This WBS level has only one activity shown as 1 Georectification System.

ID	WBS	Task Name	Duration	Start	Finish
1	1	**Georectification System**	**679 days**	**Mon 1/3/11**	**Thu 8/8/13**

Figure 1: WBS Level 1

Figure 2 shows the level 2 of WBS, in which Activity 1 is divided into 5 sub-activities. 1.1 is the inception study, 1.2 is mathematical modeling, 1.3 is model testing and validation, 1.4 is model quantification and 1.5 is software package. Each activity is large enough to be performed by an individual, so we have further divided these sub-activities.

ID	WBS	Task Name	Duration	Start	Finish
1	1	**Georectification System**	**679 days**	**Mon 1/3/11**	**Thu 8/8/13**
2	1.1	**Inception Study**	**80 days**	**Mon 1/3/11**	**Fri 4/22/11**
5	1.2	**Mathematical Modeling**	**245 days**	**Fri 4/29/11**	**Thu 4/5/12**
10	1.3	**Model Testing and Validation**	**76 days**	**Mon 4/9/12**	**Mon 7/23/12**
13	1.4	**Model Quantification**	**20 days**	**Mon 7/30/12**	**Fri 8/24/12**
15	1.5	**Software Package**	**249 days**	**Mon 8/27/12**	**Thu 8/8/13**

Figure 2: WBS expanded to Level 2

Figure 3 shows the level 3 of WBS, in which each sub-activity is further divided into small work packages.

ID	WBS	Task Name	Duration	Start	Finish
1	1	**Georectification System**	**679 days**	**Mon 1/3/11**	**Thu 8/8/13**
2	1.1	**Inception Study**	**80 days**	**Mon 1/3/11**	**Fri 4/22/11**
3	1.1.1	Review of past work	30 days	Mon 1/3/11	Fri 2/11/11
4	1.1.2	Learn the Georectification software like ENVI, ARCGIS	45 days	Mon 2/21/11	Fri 4/22/11
5	1.2	**Mathematical Modeling**	**245 days**	**Fri 4/29/11**	**Thu 4/5/12**
6	1.2.1	Model thermo elastic effect as a transformation matrix	60 days	Fri 4/29/11	Thu 7/21/11
7	1.2.2	Apply cloud filtering to the target images before registration.	30 days	Mon 7/25/11	Fri 9/2/11
8	1.2.3	Find initial estimates of geodetic coordinates using standard methods.	90 days	Tue 9/6/11	Mon 1/9/12
9	1.2.4	Refine the geodetic coordinates iteratively using DEM data.	60 days	Fri 1/13/12	Thu 4/5/12
10	1.3	**Model Testing and Validation**	**76 days**	**Mon 4/9/12**	**Mon 7/23/12**
11	1.3.1	Validate the model by testing it with UK-DMC2.	30 days	Mon 4/9/12	Fri 5/18/12
12	1.3.2	Test it with a number of images representing different textures	45 days	Tue 5/22/12	Mon 7/23/12
13	1.4	**Model Quantification**	**20 days**	**Mon 7/30/12**	**Fri 8/24/12**
14	1.4.1	Define model accuracy and the time it takes to generate the output	20 days	Mon 7/30/12	Fri 8/24/12
15	1.5	**Software Package**	**249 days**	**Mon 8/27/12**	**Thu 8/8/13**
16	1.5.1	Develop software package for Georectification method.	180 days	Mon 8/27/12	Fri 5/3/13
17	1.5.2	Design the software interface and layouts according to NDMA requirements	30 days	Mon 5/13/13	Fri 6/21/13
18	1.5.3	Write the project report and software manual.	30 days	Fri 6/28/13	Thu 8/8/13

Figure 3: WBS Level 3

Graphical form of level 3 WBS is given in Figure 4. This form is generated in WBStool software.

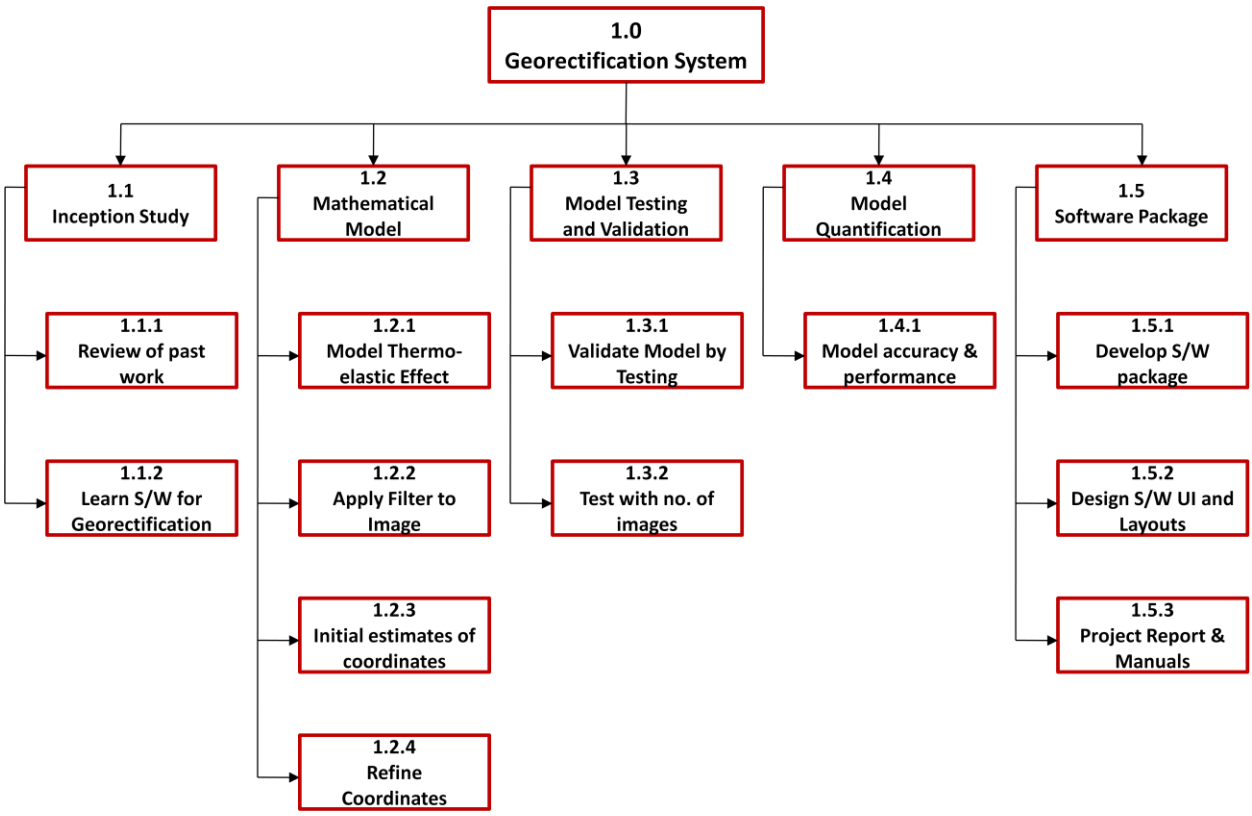

Figure 4: WBS graphical form

3.2 COST BREAKDOWN STRUCTURE

The overall estimated cost of the project is £200k. The breakdown of the estimated budget is given in Figure 5. Cost assigned to each activity is mentioned on the activity. We have assigned an extra cost where all the work packages under an activity are integrated. We call it integration cost.

ID	Cost	WBS	Task Name	Duration	Start	Finish
1	**$2,000,000.00**	**1**	**Georectification System**	**679 days**	**Mon 1/3/11**	**Thu 8/8/13**
2	**$200,000.00**	**1.1**	**Inception Study**	**80 days**	**Mon 1/3/11**	**Fri 4/22/11**
3	$150,000.00	1.1.1	Review of past work	30 days	Mon 1/3/11	Fri 2/11/11
4	$50,000.00	1.1.2	Learn the Georectification software like ENVI, AR	45 days	Mon 2/21/11	Fri 4/22/11
5	**$600,000.00**	**1.2**	**Mathematical Modeling**	**245 days**	**Fri 4/29/11**	**Thu 4/5/12**
6	$210,000.00	1.2.1	Model thermo elastic effect as a transformation ma	60 days	Fri 4/29/11	Thu 7/21/11
7	$90,000.00	1.2.2	Apply cloud filtering to the target images before re	30 days	Mon 7/25/11	Fri 9/2/11
8	$190,000.00	1.2.3	Find initial estimates of geodetic coordinates using	90 days	Tue 9/6/11	Mon 1/9/12
9	$110,000.00	1.2.4	Refine the geodetic coordinates iteratively using D	60 days	Fri 1/13/12	Thu 4/5/12
10	**$400,000.00**	**1.3**	**Model Testing and Validation**	**76 days**	**Mon 4/9/12**	**Mon 7/23/12**
11	$260,000.00	1.3.1	Validate the model by testing it with UK-DMC2.	30 days	Mon 4/9/12	Fri 5/18/12
12	$140,000.00	1.3.2	Test it with a number of images representing diffei	45 days	Tue 5/22/12	Mon 7/23/12
13	**$300,000.00**	**1.4**	**Model Quantification**	**20 days**	**Mon 7/30/12**	**Fri 8/24/12**
14	$300,000.00	1.4.1	Define model accuracy and the time it takes to gen	20 days	Mon 7/30/12	Fri 8/24/12
15	**$500,000.00**	**1.5**	**Software Package**	**249 days**	**Mon 8/27/12**	**Thu 8/8/13**
16	$300,000.00	1.5.1	Develop software package for Georectification ma	180 days	Mon 8/27/12	Fri 5/3/13
17	$140,000.00	1.5.2	Design the software interface and layouts accorc	30 days	Mon 5/13/13	Fri 6/21/13
18	$60,000.00	1.5.3	Write the project report and software manual.	30 days	Fri 6/28/13	Thu 8/8/13

Figure 5: Cost Breakdown Structure

3.3 PROJECT SCHEDULE

Project schedule gives the estimated time in which the whole project will finish. For this project, estimated time is 2 years and 8 month. Further, each work package identified in level 3 WBS is also given estimated time. Figure 5 gives the project schedule in the form of GANTT chart, generated in MS Project 2002.

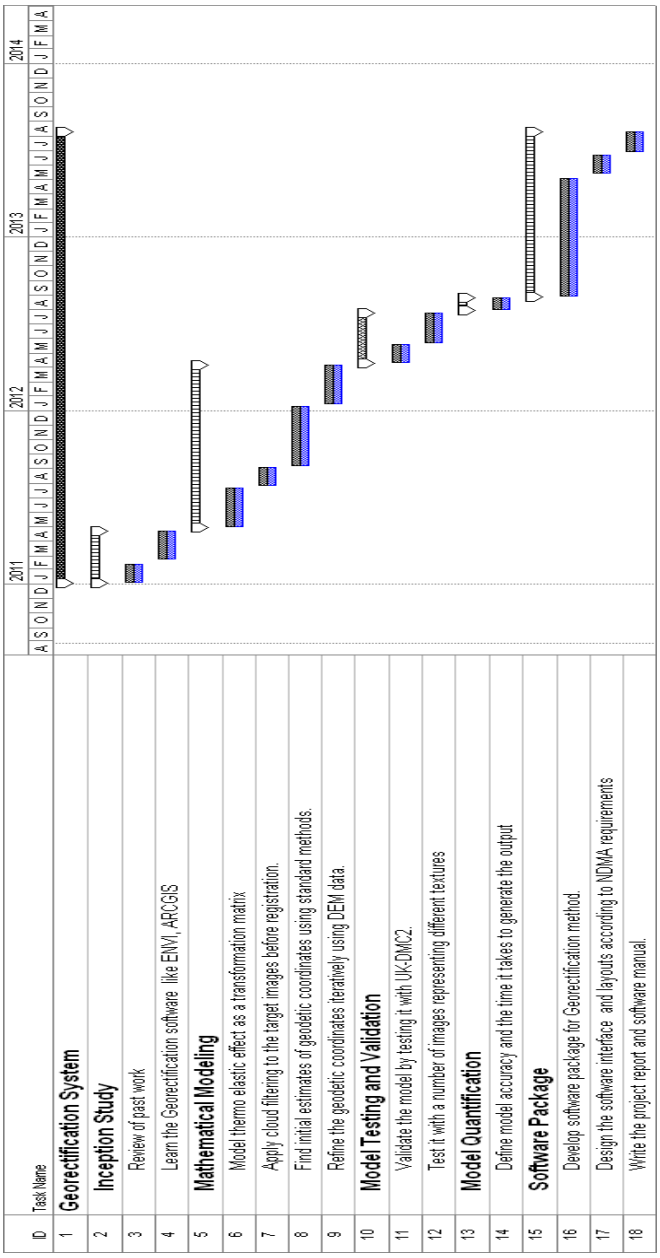

Figure 6: Project Schedule

3.4 RESPONSIBILITY ASSIGNMENT MATRIX

This matrix identifies the responsibilities of each person involved in the project. Table 2 gives the responsibilities of all 7 project team members. Note that role of each team member is given in table 1.

Table 2: Responsibility Assignment Matrix

Responsibility Assignment Matrix		
	Name	Responsibility
1.	Member 1	Mathematical Model Development, simulation, validation and testing.
2.	Member 2	Project plan, budget management, evaluation and review of progress
3.	Member 3	Data Acquisition
4.	Member 4	Organisation of HR, meetings and communication among the team members and purchasing of hardware and specialized software.
5.	Member 5	Procurement of serve ices outside organization and managing organisation's facilities and equipment.
6.	Member 6	Responsible for designing, developing, validating, change control.
7.	Member 7	Managethe software package

3.5 NETWORK DIAGRAM

Given below are the network diagrams for the project. Red rectangles show the start and the end activity of the project. Figure 6 shows the level 1 of network diagram, in which there is only one activity (both start and end).

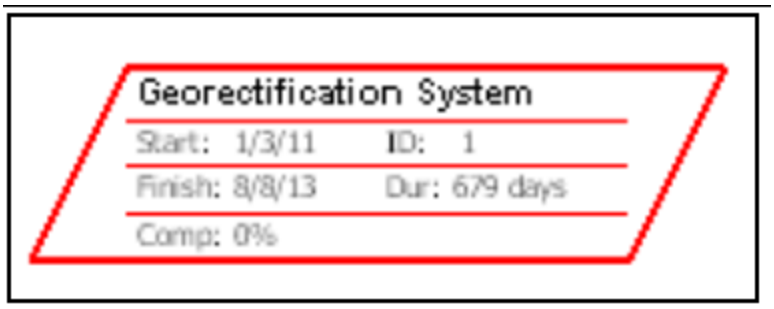

Figure 7: Level 1 Network Diagram

Figure 7 shows the level 2 network diagram, in which activity 1 is further expanded into sub-activities. Start of the project is the Georectification System and end of project is software package.

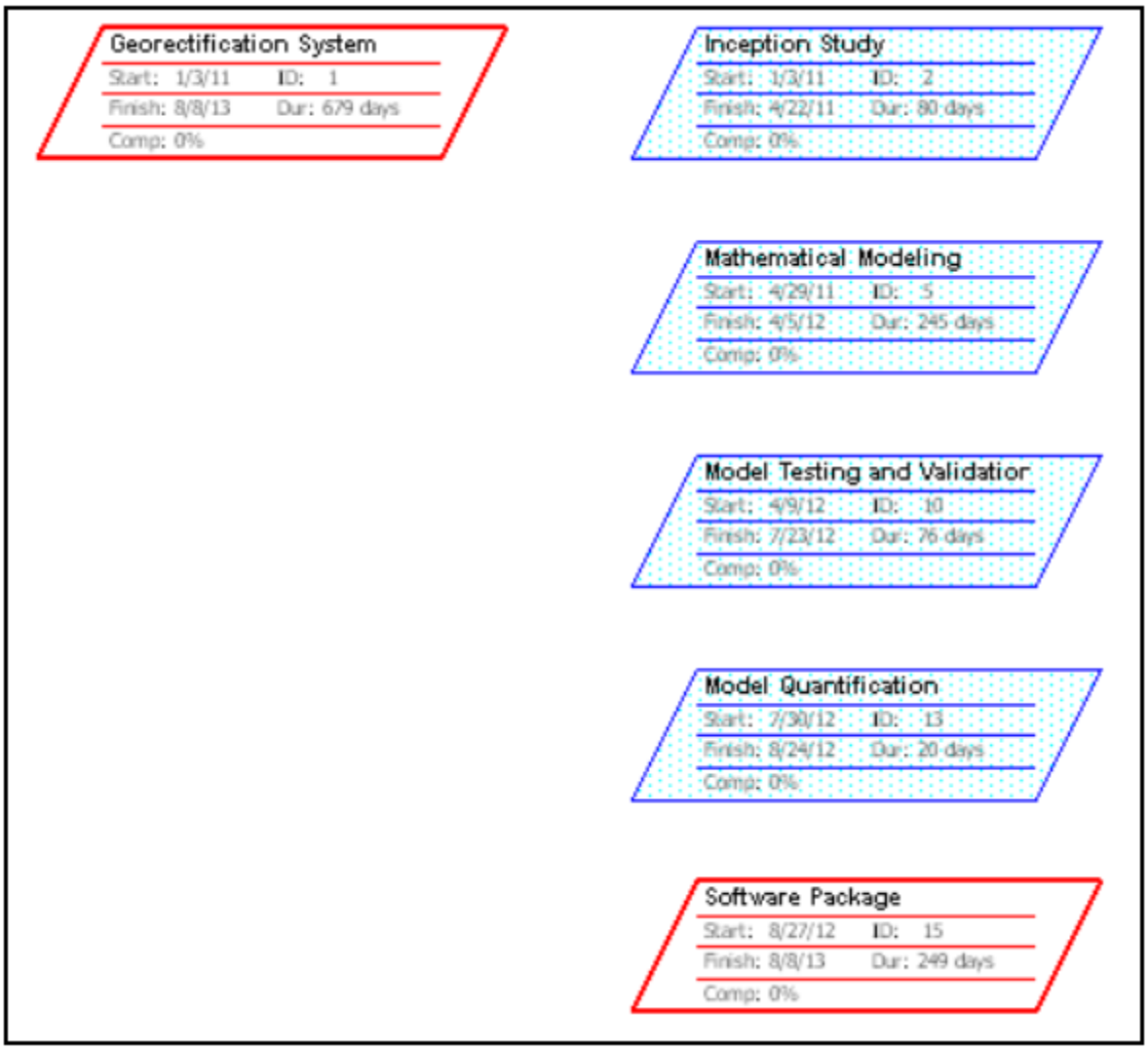

Figure 8: Level 2 Network Diagram

Figure 8 gives the level three network diagram.

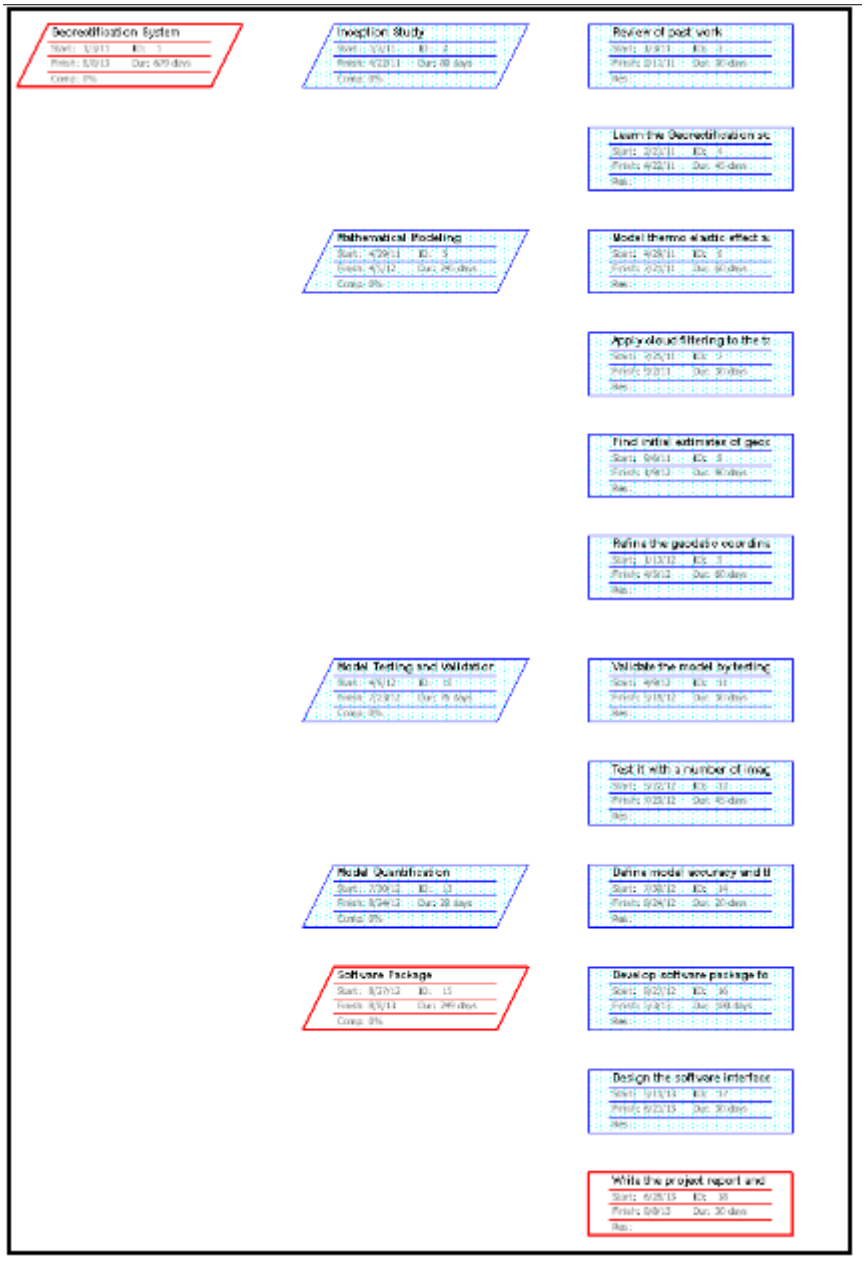

Figure 9: Level 3 Network Diagram

3.6 CRITICAL PATH

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4. PROJECT CLOSING

The project is closed when the customer executes the acceptance test plan and the product meets the customer's requirements. At project closure, the customer has to sign the customer acceptance form so that the project can be formally closed.

Customer Acceptance Form

Hospital Emergency Management System

Version 1.0 Issued 26 April 2011

Project: Hospital Emergency Management System	
This document has been issued by: Project Team	Date Issued: 2/09/10

The Project Outcome has been measured against its acceptance criteria and has been formally accepted on behalf of the customer. The project may now be closed.

Additional Comments about the Customers Acceptance:
Recorded Shortfalls of the Final Project Outcome (if any):

Executive / Sponsor:	Signature:_____
	Name: _____
	Date: 2/09/10
Project Manager:	Signature: _____
	Name: _____
	Date: 2/09/10