Cardiff University Computer Science
One Semester Individual Project 2016
CM3203 - 40 Credits

AUTOMATION OF SPORTS VIDEO ANALYSIS

Initial Plan

Author: Thomas Morley

Student ID: C1217615

Supervisor: Prof. David Marshall

Moderator: Dr. Federico Cerutti

Contents

Project Description 2
Ethics 3
Aims and Objectives 3
Deliverables 4
Work Plan 5
Risk Removal 5
Approach to Project Timeline 5
Timeline 6
Outline of Tasks 6
Appendix 9
Project Gnatt Chart 10

Project Description

This project looks to help build on the collaboration the university has with the WRU (Welsh Rugby Union) and Swansea University. Currently games are annotated and an analysed using expert sports coders employed by the WRU. During games key points are noted down and these are then analysed and synced to the game video for in depth match reports.

Key events during games are events such as line outs, tries and scrums. An issue with the game of rugby is that it is a contact sport and multiple bodies can overlap. This causes the systems issues as the structures like scrums and mauls do not have very well defined edges between players. This is why many systems use a combination of tags (GPS tracker and accelerometer) and camera systems to track players. Examples of systems that use this technology are below:

- ChyronHego - http://chyronhego.com/
  - Used in Bundesliga (German top Flight Football)
- Sportstec - http://sportstec.com/
- isoLynx - http://www.finishlynx.com/isolynx/

The use of both tags and cameras improve the tracking system but they still need to be analysed by sports experts and this is where this project looks to improve on the stats that are automatically removed from the tracking system that is in place.

A tracking system has already been put in place using footage captured by an overhead video system that gives a bird's eye view of the game. The tracking system allows for the selection of a player and then for data to be gathered. This does not use extra data from tags so is highly reliant on the footage being good for tracking. But due to the issue stated above with the tracking of players the gathering of statistics will be used on footage of plays between phases.

The tracking system will be the starting point of the project. At the moment the tracking system works but there is no tangible data that will be useful to the teams. The aim of this project is to build a system on top of the tracking so

that useful data can be presented and analysis features can be built to allow teams to use this system.

If successful this system would not only allow for teams to gather statistics for their own team but that of others as it would only require captured footage of the other team. While this project will be looking at rugby union in particular this system will be useful and minimal changes to coding would be needed for use in rugby league. Also this system would be good for other team sports like American Football.

Ethics

Due to the footage being used is from the WRU there will be one issue of confidentiality. During this project when using and storing the footage it must be held securely. The confidentially of this data must also be explained to anyone involved in this project as data and footage will be seen.

Aims and Objectives

Below are a list of aims that the project will target. These aims will help define how successful the project has been.

Main Aims

- Understand what analytical features are useful to the target audience
    - If the program is to be used then useful features will be needed

- Produce a working program that allows a person to run multiple phases of play and retrieve tangible data on the events that occurred.
    - To produce a result for the aim above the basic analytical features produced must have a wide variety of both attack and defence.

- Produce a very basic and usable UI.
    - The analytical features are the most important feature but a useable UI must be implemented.

Secondary Aims

These are aims that would be useful but will more than likely be in future developments of the program.

- Linking tag data to tags.
    - This would help improve the tracking feature and could possibly give more statistical data that can be used

- Develop more advance analytical features
    - For more advance moves within a sport different types of data will be captured. This will be an advancement on the features that will be implemented so features are to be made editable.

- The program will only work on clips that have been cut into phases if the program could have a full clip run through it and results produced it would remove the tedious task of clipping the video.
    - This is currently to advanced for the project but could be achievable in future developments

Deliverables

During this project there will be 3 main deliverables. These will be:

1. Initial Plan
    - Outline of project and Aims
    - Timeline of Project
2. Final Report
    - Design Implementation
    - Test Results
    - Analysis of Outcome
3. Program
    - Working Program
    - Source Code

Work Plan

This section looks at the approach and timeline of the project to be able to achieve the project aims. The timeline is not static and if needed will be changed throughout the project.

Risk Removal

Due to the fact I am the only resource for the project there is minimal risk involved with communication and timing. The only real issues that could arise are due to the organisation of my time. Below are 3 areas that I have raised as possible risks during the project:

1. Running behind Schedule (Main Risk)
    - To evade this constant meetings with the supervisor to update on schedule will be used.
    - All tasks will be monitored using the time plan set in this document. (See Appendix for time plan)
    - If this does arise then a meeting with the supervisor must be made. So adjustments to the plan can be made.

2. Final Report Write Up Time
    - Time has been set for the write up but due to the length and amount of information in this project it could become an issue
    - To minimise the risk write ups and notes must be made throughout the project.

3. Version Tracking
    - To minimise the impact of code changes a tracking system must be put in place
    - What tracking system will be used will be discussed with the supervisor before the development stage.

Approach to Project Timeline

Due to the short timescale of the project and the fact that there is only one resource a hybrid system will be used to develop the project. The main method that will be followed is the waterfall method.

Although the waterfall method will be followed for the most of the project. During the testing phase the iteration method may be used as bug fixes may cause parts of the program to change meaning constant testing and document changes will occur.

Timeline

During the project lifetime there will be certain events and tasks that will take place constantly. These will be put in place so constant milestones and short goals can be made so targets are hit. The two events are below:

- Supervisor meetings
    - Mondays every week
    - Review work from previous week
    - Set goals for the week ahead
- Write up for final report
    - Keep notes and design implementation up to date by constantly and consistently updating them for inclusion in final report.
    - Details of report are to be discussed with the supervisor

As stated above the timeline does have some leeway in the timings. If there is to be a significant change then this will have to be raised as an issue. To keep in check review meetings have been put in the timeline and deadlines such as testing must be achieved.

Below is an outline of the tasks set and the Gantt chart with timings for these tasks can be seen in the appendix.

Outline of Tasks

Task 2 - Background Work

Understand what information will be useful to the target audience. This allows the development of the analytical features. (E.g. What analysts want to use)

Task 3 – Basic UI and feature Design

After finding what is required / useful from the background work develop the features that will be used.

Task 4 – Understand Current tracking System

Using the tracking system understand what information can be used and manipulated to help create the features. Development of the analytical features may require changes to the tracking system these can be during the execution of task 4.

Task 5 – Develop Data for Analytical Features

Take the data presented by the previous task and develop useful analytical information. That can be presented through the UI.

Task 6 – Implement Analytical features Using Data

From the data created. Now build usable features that will be used within the program. Brief testing of the features can also take place here.

Example of features could be

- **Attack Plays**
  - depth of line
  - patterns of play
- **Defence Plays**
  - flatness / single line
  - patterns of defence (Blitz defence/drift defence)

Task 7 – Implement and Develop Usable UI

Features that have been created and tested can now be linked together within a UI.

Task 8 – Final Editing of Program

Ensure that the program has been documented and commenting of the code is complete. This will allow for future development should it be required.

Task 9 – Develop Test Plan

Based on the features produced and the UI developed, create a test plan to understand the boundaries and see what the features limitations are.

Due to the testing some new footage will be needed to run some tests. The gathering of the footage will need to be done early in the project cycle to enable testing.

Task 10 – Testing

Run the test plan and capture results.

Task 11 – Fixes and Retests

Based on the testing results found if fixes can be changes can be made in line with testing. Allowing immediate retest.

Task 12 – Final Review of Project

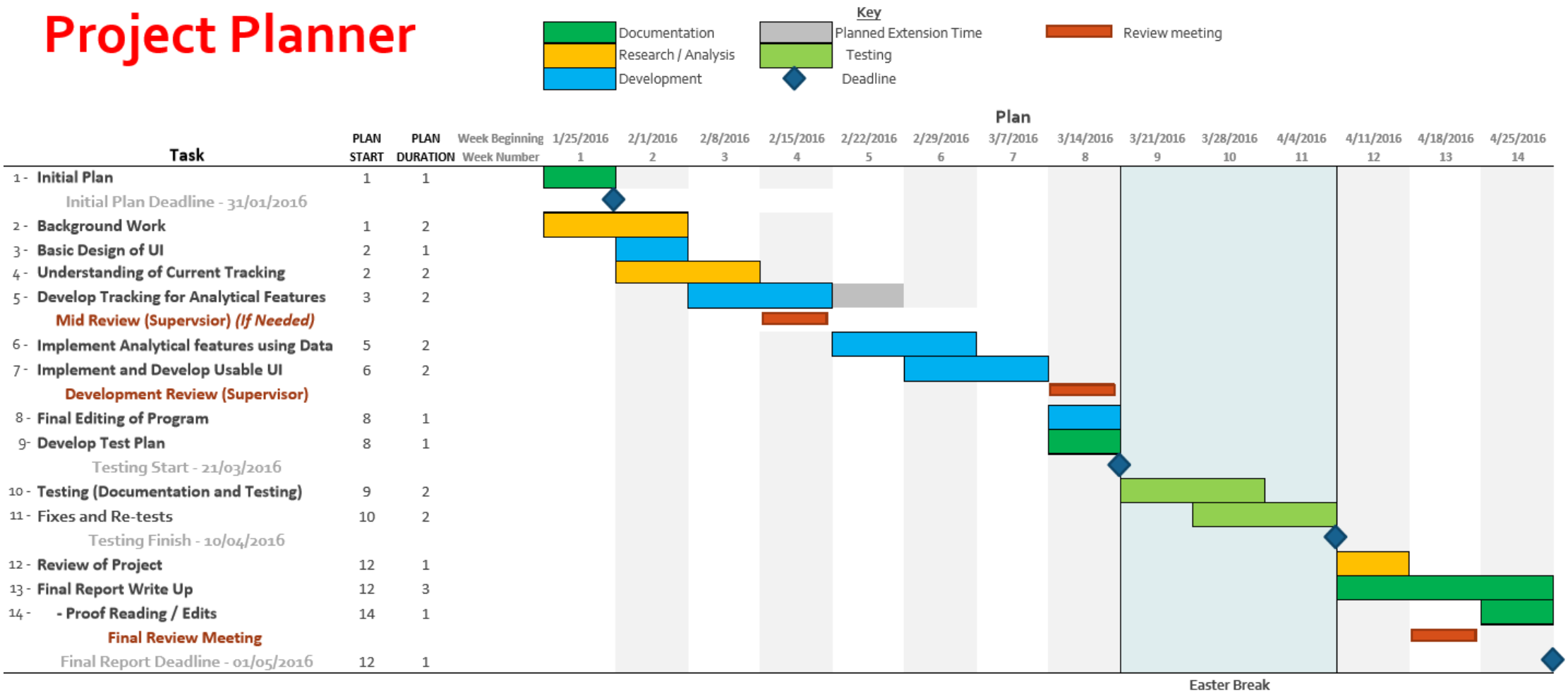
From the test results and program that has been created compare these to the project aims that have been set in initial plan. The results can then be analysed with the supervisor at the final review meeting.

Task 13 – Final Write Up

Although this is done throughout the project it needs continuous verification and construction throughout the life of the project. Final write-up will ensure quality of the document.

Task 14 – Proof Read

End of the project is near. All deliverables are to be checked and verified for the deadline. Any points raised from the final review meeting can be added here and project can then be submitted.

Appendix

Project Gnatt Chart