Initial Plan

Designing and making judging aid for canoe slalom

Author: Harry Batchelor (C1816377)

Supervisor: Dr Ian Cooper

CM3203 – One Semester Individual Project

Project Description

Canoe slalom, as with any other high level sport, has a thin margin for error when it comes to judging. That is why I am proposing a judging aid for canoe slalom judges. Since the 2018 season, the International Canoe Federation (ICF) have started using video technology to aid judges[1]. This video replay system is used to help the video judge analyse whether or not an athlete has passed through a gate if there is a discrepancy between the on bank judges. The video judge is able to take video from 12 different cameras, manipulate the video and finally make their decision on whether the athlete should get a penalty. Unfortunately, due to the nature of the technology needed, this form of video judging is only available at the highest level of the sport, such as world cups or the Olympics, meaning amateurs, such as myself and other members of Cardiff University Kayakers are missing out on the key ability to know which way a close call falls. This replay system could also be used as a metric for the paddler to see if they have room to go even tighter around the pole, possibly saving themselves more time.

My project aims to solve this gap in the market by creating a simple judging aid which can be used by amateurs without the need of having a large judging team. The system will be made up of sensors, cameras, and microprocessors, connected to the internet to allow a judge or a coach to review the outputs from the sensors and cameras to gain a better understanding of the athletes performance on the gate.

One of the biggest problems that the project will face, is trying to detect between what is a legal hit and what is an illegal hit. For example, when an athlete hits the pole with their head, this an illegal hit. In a different example, if an athlete were to spray water into the pole, that could be detected as a hit on my software, but it wouldn't count as a penalty against the paddler, the same applies if the wind were to knock the pole.

Project Aims and Objectives

Below are the fundamental aims and objectives of the project. Each aim contains several objectives that I must complete for me to achieve the overall aim of the project.

Background research

Before any significant work can be started, I must conduct some research to discover the best approach to find my solution. This is for both the physical product, such as microprocessors or sensors, as well as the frameworks to display the data. My main objectives are such:

- Identify the different types of sensors, cameras, and microprocessors that could be used. Work out the combination to achieve the best chance of an accurate reading.
- Research existing solutions, possibly across other sports.
- Research web app solutions to take sensor outputs to a website or similar.

Sensor and camera array

My next aim is to implement a sensor and camera array onto the actual slalom pole. This is a vital feature for the project and without this aim the whole project will fail. My objectives are as such:

- The programme should be able to detect if something has hit or touched the pole.
- The programme should also be able to distinguish between a positive hit and a false positive, such as wind.

[1] (Planet Canoe, 2018)

- The camera should be able to show a 5 second loop once the athlete has passed through the gate

Web Solution

The web aspect of the project is also a major aim that I need to complete. This is because without it, the judges won't be able to make a live decision, by itself would slow down the race. My objectives are as such:

- The web solution must show data from all sensors and cameras.
- The data must be presented in a way that is simple and easy to understand.
- The system must produce the results in a time sensitive matter.

Work Plan

Below, I have created a work plan for the duration of the project, going week by week. I have designed the plan to be realistic, to allow me to follow it as closely as possible. As with any project the exact details of each week are subject to change, that is why I have kept the easter break clear in case there is any backlog with tasks. The easter break could also be used to implement more complex themes if the project is progressing well.

Once I reach each major milestone, I will be having a meeting with my supervisor, to make sure the project is still on track and each task has been completed successfully to the level that is required. The outcomes of the meetings could also be to adjust future work depending on milestone progress. Along with milestone meetings, I am also having weekly meetings with my supervisor, to keep things running smoothly and in the right direction.

Week	Tasks	Milestones
Week 1 31/01/21	• Write initial plan • Meet with supervisor to finalise aims of the project	
Week 2 07/02/21	• Start background research on sensors and technology • Start learning and experimenting with necessary technology and frameworks • Design the physical product	Initial plan submitted
Week 3 14/02/21	• Make the physical slalom pole • Create the basic sensor solution • Start writing introduction and background for final report	
Week 4 21/02/21	• Continue working with sensors • Begin work on sensor calibration	Sensors are set up and working
Week 5 28/02/21	• Finish sensor calibration • Start designing web app • Begin writing approach section of final report	
Week 6 07/03/21	• Start work on implementing camera onto the pole • Work on web app • Continue with more report	
Week 7 14/03/21	• Continue with more report writing • Work on instant replay for camera	

Week 8 21/03/21	• Finish web app	Final product should be mainly finished apart from testing
Week 9 28/03/21	• Start testing final product	
Week 10 04/04/21 **(Easter)**	• Additional contingency time	
Week 11 11/04/21 **(Easter)**	• Additional contingency time	
Week 12 18/04/21 **(Easter)**	• Additional contingency time	
Week 13 25/04/21	• Finish testing and evaluation of the product • Focus on report writing	
Week 14 02/05/21	• Focus on report writing	
Week 15 09/05/21	• Finish writing and editing report	Report deadline 13/05/21

Risks

The first risk to the project will be to do with the compatibility of the microprocessor and the sensors/cameras, but with enough background research I should be able to mitigate this risk. The same applies for any software issues. If I do enough research into the available frameworks there shouldn't be any issues.

If I do come across any issues with the project, that can't be fixed during the easter break, I can scale down the project to miss small details, such as the replay function on the camera, or the web solution entirely. Missing milestones like this will drastically decrease the success of the whole project and should be avoided at all costs.

Ethical considerations

It may be necessary to gain the feedback of human participants during the testing stage of the project. This will be done through user testing. If I do use user testing then I would need to collect data from the participants, and most likely get their consent to be recorded. For me to be able to involve human participants I will be following the university's policy on ethics, and approval will be obtained from the School's Research Ethics Committee.[2] However I will be starting the project with the approach of testing the system on people, without gaining any feedback on the system. Instead I will be discussing with my supervisor whether the system has achieved the goals that I had set out above.

[2] (Zoumpoulaki, et al., n.d.)

References

Planet Canoe. 2018. *Behind the scenes - ICF Canoe Slalom judging.*
Available at: https://www.youtube.com/watch?v=symeJ4kKsCY&ab_channel=PlanetCanoe
[Accessed: 31/01/2022]

Judging in Canoe Slalom. 2018. Available at:
https://www.canoeicf.com/sites/default/files/2018_module_1-judging_clinic_participant_version.pdf
[Accessed: 01/02/2022]

Zoumpoulaki, Booth & Turner, n.d. Computer Science and Informatics Ethics. [Online]
Available at: https://www.cs.cf.ac.uk/ethics/
[Accessed: 31/01/2022]