# RFID Based Race Time Tracking System

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## ABSTRACT

The poster presents an overview of a project carried out by postgraduate IT students of Southern Institute of Technology Invercargill for a major tourism operator in Queenstown. Aim of this project is to implement a RFID based race time tracking systems for a walking track. These data will be transferred to a web application to produce different reports related to personal timing of members which is viewable online through their profile page. UHF Antennas connected to RFID readers were used to detect the members on the track, using passive RFID tags attached to each of them.

**Keywords**: RFID, Race Time Tracking

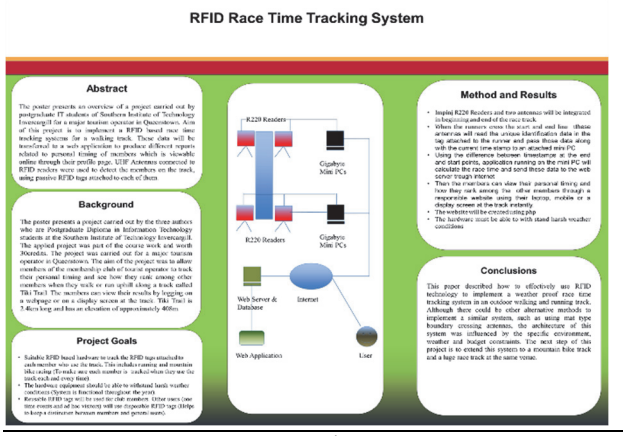
## 1. INTRODUCTION

The poster presents a project carried out by the three authors who are Postgraduate Diploma in Information Technology students at the Southern Institute of Technology Invercargill. The applied project was part of the course work and worth 30credits.

The project was carried out for a major tourism operator in Queenstown. The aim of the project was to allow members of the membership club of tourist operator to track their personal timing and see how they rank among other members when they walk or run uphill along a track called Tiki Trail. The members can view their results by logging on a webpage or on a display screen at the track. Tiki Trail is 2.4km long and has an elevation of approximately 408m.

## 2. BACKGROUND

Radio frequency identification (RFID) technology is used for wide variety of applications ranging from building access control, retail stock management, tracking library books, theft prevention and movement tracking (Roberts, 2006).

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But using this technology for race time tracking came with several technical challenges. When several runners cross the end line at the same time readers has to identify several tags at the same time. But due to tag massages cancelling each other out some readers do not have the ability to identify multiple tags accurately. Therefore we had to use an advanced RFID system which uses anti-collision techniques (Vogt, 2002).

Another challenge was readers had to track tags attached to runners who are moving at a fast phase far from the reader. Due to this we used far-field emission based RFID tags and antennas which operates at UHF 860 – 960 MHz frequency range. Passive tags were used due to low cost and ability to work without a power source (Want, 2006)

## 3. PROJECT DESIGN

Two RFMAX RFID Race Timing Antennas were placed on left and right side of the track at the start line which are connected to an Impinj Speedway Revolution R220 UHF RFID readers. These antennas can operate at -55° to +71 °C. Therefore it can withstand harsh weather condition in outdoor such as heavy rain and snow. Because these are tripod type antennas it will not get submerged by snow like mat type boundary crossing antennas. The same setup was duplicated at the end line as well.

When a runner crosses the start and end lines these antennas will read the unique identification data in the tag attached to the runner and pass those data along with the current time stamp to an attached mini PC. Using the difference between timestamps at the end and start points, application running on the mini PC will calculate the race time and send these data to the web server trough internet. Then the members can view their personal timing and how they rank among the other members through a responsive website using their laptop, mobile or a display screen at the track instantly.

## 4. CONCLUSION

This paper described how to effectively use RFID technology to implement a weather proof race time tracking system in an outdoor walking and running track. Although there could be other alternative methods to implement a similar system, such as using mat type boundary crossing antennas, the architecture of this system was influenced by the specific environment, weather and budget constraints. The next step of this project is to extend this system to a mountain bike track and a luge race track at the same venue

## 5. REFERENCES


Roberts, C. M. (2006). Radio frequency identification (RFID). *Computers & Security*, *25*(1), 18-26.

Vogt, H. (2002). Multiple object identification with passive RFID tags. *Systems, Man and Cybernetics, 2002 IEEE International Conference on, 3* (6-). Yasmine Hammamet, Tunisia: IEEE. doi: 10.1109/ICSMC.2002.1176119

Want, R. (2006). An introduction to RFID technology. *IEEE Pervasive Computing*, *5*(1), 25-33.