**Autonomous Rampaging Chariot Progress Report for March 2017**

**Background.**

The Autonomous Rampaging Chariot is a Scottish Secondary school coding project. This new ‘module’ delivers a comprehensive kit of parts and instructions to convert a radio controlled Rampaging Chariot Sporting Robot*, (previously constructed by Scottish Secondary pupils under an existing extra-curricular STEM initiative)*, into an Autonomous sporting and exploration Robot controlled by a Raspberry Pi computer programmed in Python. It is an exciting upgrade to an already successful project and focuses on teaching coding in a real-time environment The Project is delivered by Rampaging Chariot Guild STEM volunteers in partnership with Leonardo MW and the SCDI.

Digital Xtra funding has been used to manufacture and trial the Autonomous enhancement in four schools:

Johnstone High School, Renfrewshire,

Merchiston Castle School, Edinburgh

Sgoil Lionacleit, Benbecula,

The Glasgow Academy

The Autonomous trial targets the upper end of secondary school (S3,4,5) with teams consisting of four or five members. One school has two team members from (S2). All schools are doing the project as an extra-curricular activity in their STEM Club.

**Aim.**

The construction of the prototype autonomous kits by the school teams, useful feedback to improve the kit, and successful modification by pupils of the Python Code in selected modules.

**Project Timescale.**

This evaluation phase of the project is scheduled to be completed by 30 March 17 with our evaluation report due on 30 April 2017.

We have challenged the participating schools to demonstrate and compete in the Assault Course event at the annual ‘Rampaging Chariots Scottish Robotic Games’ that are hosted by Leonardo in Edinburgh on 10th June 17. We therefore intend to continue to provide help and to continue to obtain additional feedback up to that competition date.

**Project Milestone 1**

Milestone 1 (30 October 2017) was the delivery of kits to the selected schools. It was achieved before that date.

**Project Milestone 2**

The purpose of the second and final phase of this project is to collect feedback from the pupils and teachers to ensure that teething problems are discovered and dealt with efficiently and with personal attention; including a school visit where necessary. Positive feedback will lead to the project being rolled out on a large scale.

Nine visits of one or two people from the Guild and Leonardo have been made to participating schools to date.

Pupils have generally been diligent in recording progress and the difficulties they experienced in constructing the autonomous lid and testing the systems using the Python test programs provided.

**Installing the Sensors and Autonomous Systems**

All schools have completed this section satisfactorily, but progress has been slower than expected. Feedback from schools identified several factors that contributed to this:

Additional feedback, will be included in the project report.

1. The initial SDS programme delays.
2. The installation of the odometer magnets in the drive wheel hubs.
3. Lining up the odometer IC with the magnet on the drive wheel axles.
4. Attaching the Infra-red sensor to the stepper motor shaft.

**Testing the Motors, Sensors and Scanning Actuators**

The Autonomous manual provided with the kits describes how to use the Python test programs to confirm the correct functioning of each motor, sensor and actuator. A progressive approach in coding difficulty is employed with coding exercises supplied to extend the testing by modify existing Python code. Three different types of data bus are used to demonstrate their characteristics. The programs are designed to allow calibration of different physical parameters which will be transferred to the main autonomous programme at the end of the testing exercise. The route-test programme enables the robot to travel between sequential Waypoints defined by the pupils. It uses dead reckoning to avoid obstacles in the classroom, but does not do the Navigation updates which are provided in the main programme.

Progress has been slower than expected and all schools are still working through this section.

Initial feedback to date is as follows:

1. All schools got the Chariot motors and wheels turning in the correct directions at varying speeds under keyboard control.
2. Schools correctly added code modifications
3. All schools were able to get the odometers working and showing the correct readings in basic (rollover) mode and continuous count mode.
4. Some schools had initial difficulty in getting two R-Pi’s to operate correctly as a Hotspot and WiFi to allow remote start/stop functions and telemetry. Leonardo provided advice and are making modifications to make this set up easier and more reliable.
5. Some test sequences would benefit from instructional videos which we are currently working on.
6. We are waiting to deliver the latest updated version of the main programme when schools complete all the test programs.

Additional feedback, particularly on the coding aspects, will be included in the project report.

Peter J Bennett

Manager,

Rampaging Chariots Guild

30th March 2017

Copies to:

Debbie McCutcheon. Digital Extra Fund

Ketty Lawrence. Digital Extra Fund

Allan Colquhoun. Leonardo

Josh Hessey, Leonardo