

Project Specification and Division of Work

ELEE1119 Advance Computer Engineering

Project Title

Automatic 'Nerf' Sentry Gun utilising Face or Object Recognition and Target Tracking

Project Brief

To develop a prototype automatic foam dart blaster sentry gun capable of identifying targets, then actively targeting, and firing at them.

Project Objectives

1. Design and create a custom firing mechanism capable of firing foam "Nerf" darts.
2. Design and create a dynamic mounting system capable of accurately controlling the firing direction.
3. Develop a bullet counting system with scope to incorporate reloading mechanics if the design permits.
4. Develop face or object recognition software capable of identifying predefined threats and feeding back data on their location for targeting.
5. Develop a remotely accessible monitoring and/or control system, e.g. mobile app or hosted website.
6. Develop an automatic log to capture all important activities, e.g. motion detection, user logon, firing at a target, etc.

Project Methodology

From the 'Team List' document our individual skills have been identified.

Team Member's Skills						
Andrew Dean	Chris Halsall	Joshua McField	Kamyar Homampour	Joel Okanta	Sian Leigh Pugh	Harshitha Jayamala Thimmegowda
-Arduino -ESP32 -RasPi -C/C++ -MATLAB -Python -3D Design -Electronics Design	-C/C++ -HTML -CSS -Arduino -3D Design -Electronics Design	-C#/C++ -MATLAB -Javascript -SQL -HTML -CSS -Java -Arduino -Visual Studio -Photography	-C++ -Java -MATLAB -SQL -Arduino -Android Studio	-C#/C++ -MATLAB -Python -Java -SQL -Arduino -RasPi -Android Studio -Electronics	-Arduino -Python -C++ -MATLAB -PHP -Digital Art -Electrical Repair	-C#/C++ -MATLAB -Java -SQL -HTML -Android Studio -Visual Studio -Arduino -RasPi

With team member skills identified it is now possible to split the project into manageable sections with members assigned to tasks that best suit their strengths.

Task	Subtask / Description	Lead	Support 1	Support 2
Project Management	Creation of GitHub page, govern main repository pull requests, correct any GitHub related issues	Sian	Chris	-
	Physical project management, management of timescales, ensuring a coherent project direction	Andrew	Chris	Sian
Mechatronics	3D design and manufacture of motorised mounting system.	Andrew	Chris	-
	3D design and manufacture of foam dart firing system with mechanical support for the camera and any additional sensors.	Chris	Andrew	-
	Design of prototype hardware for driving combined motorised mounting and foam dart firing systems.	Chris	Andrew	-
Software	Writing of software to control motorised mounting system and communications with target acquisition system.	Harshitha	Andrew	Sian
	Writing software to control firing system and communication with target acquisition system.	Joel	Chris	Sian
	Writing of visual recognition software, defining targets and non-targets.	Sian	Joel	Kamyar
	Writing of remotely accessible monitoring/control software (Android app)	Kamyar	Josh	Sian
	Writing of remotely accessible monitoring/control software (webserver and website)	Josh	Kamyar	Sian
	Writing of Error Codes where appropriate	All S/W		
	Writing/contributing to logging file to capture all important activities	All S/W		
	Updating RREADME file	All		
Miscellaneous	Creating supporting documentation where appropriate explaining aspects of the project	All		

Expected Outcomes

1. Fully functioning '*Nerf*' sentry gun prototype capable of correctly identifying targets, then aiming and accurately firing at those targets.
2. Functional remotely accessible monitoring system with video feed and sentry position information. Possibility of control including sleep and wake commands, adding and removing persons from the target list, and manual control of the sentry's position.

Ethical Considerations

While the aims of the project hold a humorous note, autonomising a foam dart blaster, the technology could easily be adapted to create a considerable threat to life. Therefore, it is important to consider the associated ethics. An appropriate license should be used to limit how the associated code is used. Further considerations shall be covered in the project report.

Health and Safety

It is important to consider the health and safety of all persons in the immediate vicinity of the project, especially during active testing. The following risk management table has been created to ensure safety is upheld. Likelihood and Severity are measured out of 5 with 5 as the most likely or severe.

Risk	Likelihood	Severity	Mitigation
RSA, eye strain, other office related injuries	3	2	All members to take regular breaks, ensure equipment is correctly setup (correct screen height, etc).
Eye Injury from foam blaster	3	4	When blaster is 'charged' it is to be put in a position where it is impossible for a foam dart to directly enter the eye OR Members to wear eye protection. Code to be developed to specifically target the center of mass of a person or object.
Electrical Shock	2	5	Where possible, avoid working with home 230VAC. Instead, prefer consumer power supplies. If working with higher voltages, ensure the supply is isolated while handling components or wiring.
Mechanical Injuries	2	3	Use correct techniques when handling power or hand tools. Ensure power to moving parts is isolated before handling them. Consciously design out mechanical entrapment risks.