Department of Computer Science and Engineering
College of Engineering
Qatar University

Senior Project Report

Intelligent Mobile Target Visitation of a UAV using DRL: A Practical Implementation of the Work by Hendawy *et al.*

Project Group Members

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This project report is submitted to the Department of Computer Science and Engineering of Qatar University in partial fulfillment of the requirements of the Senior Project course.

Declaration

This report has not been submitted for any other degree at this or any other University. It is solely the work of us except where cited in the text or the Acknowledgements page. It describes work carried out by us for the capstone design project. We are aware of the university's policy on plagiarism and the associated penalties and we declare that this report is the product of our own work.

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Abstract

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

Acknowledgment

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1 Introduction and Motivation

1.1 Problem statement

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

1.2 Project significance

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

1.3 Project objectives

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2 Background and Related Work

2.1 Background

2.2 Related work

The main idea here is to make the drones autonomous and intelligent in support of target detection features. The drone was limited to specific boundaries and fixed targets such as crops in the agriculture field [7]. In our work, the unmanned aerial vehicle (UAV) will scan mobile targets intelligently and will guess their location. A microcontroller was used to control the drone and execute commands just like our work, but we will use ANAFI SDK for ANAFI drones, not custom ones presented in [7], [9]. Image and video processing techniques were used, such as segmentation to keep detecting moving targets was presented in [8]. For the navigation part

in [8], they used predetermined waypoints related to historical path cost. However, in our work, probability and mobility patterns will be used. What these papers need are some intelligent algorithms and power and time consideration. Here comes the role of deep reinforcement learning (DRL), which will make the system more intelligent and efficient.

3 Requirements Analysis

3.1 Functional requirements

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3.2 Design constraints

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3.3 Design standards

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3.4 Professional code of ethics

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3.5 Assumptions

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4 Proposed Solution

4.1 Solution overview

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4.2 High level architecture

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4.3 Hardware/software to be used

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5 Proof of Concept

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6 Market Research and Business Viability

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7 Project Plan

7.1 Project milestones

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7.2 Project timeline

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7.3 Anticipated risks

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8 Short Guide

Please read the guides available online about the right way to write LaTeX such as how to include a math symbol in text (e.g. x not x) and a proper noun with all capitals (e.g. SQL not SQL).

Below are examples of different constructs in a report. You can copy-paste and change the content. For more information, refer to the relevant package manual in CTAN.

8.1 Abbreviations

To add an abbreviation (e.g. UAV), append the following line in the list of abbreviations portion in main.tex: `\newacronym{uav}{\textsc{uav}}{unmanned aerial vehicle}`

To use the abbreviation, there are 3 ways to do so:

1. In a normal case: `\gls{uav}`
2. For its plural form: `\glspl{uav}`
3. In the beginning of a sentence: `\Gls{uav}`
4. A combination of cases 2 and 3: `\Glspl{uav}`

For example:

> An UAV has many unique features. UAVs have been used in many different applications.

Figure 1: The arch linux logo

8.2 Figure

8.3 Equations

$$E_p = mgh = mg(x_f - x_i) \tag{1}$$

$$E_k = E_t + E_r$$

$$E_t = \frac{1}{2}mv^2 \tag{2}$$

$$E_r = \frac{1}{2}I\omega^2 \tag{3}$$

$$I = \frac{1}{2}MR^2 \tag{4}$$

$$\omega = \frac{v}{r}$$

$$E_k = \frac{1}{2}mv^2 + \frac{1}{2}I\left(\frac{v}{r}\right)^2 \tag{5}$$

where E_p is the potential energy, E_k the kinetic energy, E_t the translational energy and E_r the rotational energy.

$$\begin{aligned}
\frac{\partial E_p}{\partial m} &= \frac{\partial}{\partial m}(mgh) \\
&= gh \\
\frac{\partial E_p}{\partial g} &= \frac{\partial}{\partial g}(mgh) \\
&= mh \\
\frac{\partial E_p}{\partial h} &= \frac{\partial}{\partial h}(mgh) \\
&= mg
\end{aligned}$$

8.4 Simple table

Table 1: Slope, intercept and their uncertainties

Slope		Intercept (J)	
Value	Error	Value	Error
1.0933	0.0300	0.0148	0.0157

8.5 Table from a csv file

Table 2: Translational and rotational energies.

m kg	v_m $\mathrm{m\,s^{-1}}$	E_t J	δE_t J	E_r J	δE_r J
0.055	0.17	0.000 79	0.000 01	0.280	0.007
0.075	0.20	0.001 50	0.000 02	0.387	0.010
0.095	0.23	0.002 51	0.000 03	0.512	0.013
0.115	0.25	0.003 59	0.000 03	0.605	0.015
0.135	0.27	0.004 92	0.000 04	0.706	0.018

8.6 Graph from a csv file

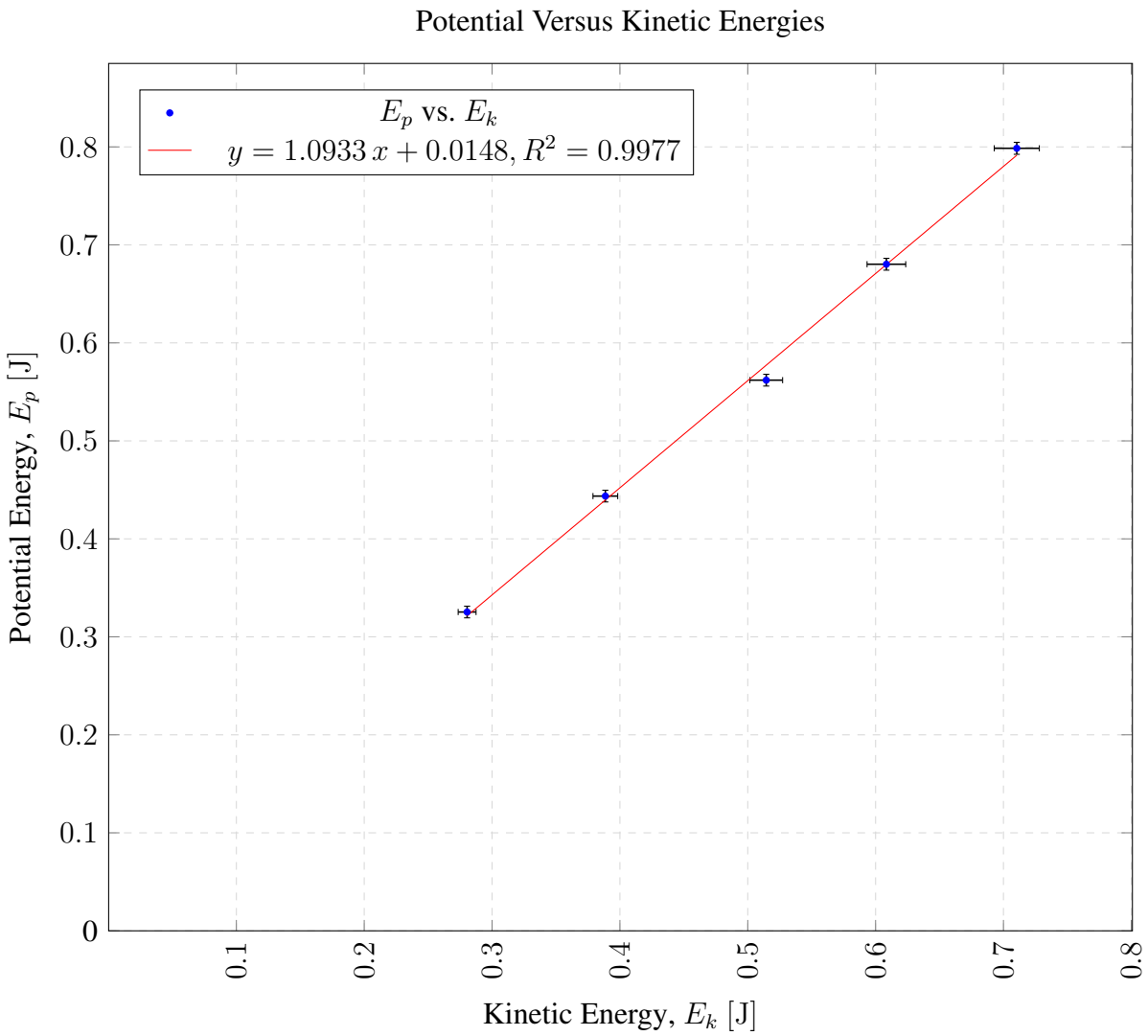

Figure 2: The relationship between potential and kinetic energies.

8.7 Citations

- **in-text citation**: use `\cite{dirac}` to produce **dirac** or `\textcite{dirac}` to produce **dirac**
- **citation in parentheses**: `\parencite{knuthwebsite}` produces [**knuthwebsite**] (for IEEE, this has no difference to the `\cite{}` command above.)

8.8 Cross-references

Label using suitable names with the following format: figure `\label{fig:<name>}`, tables `\label{tab:<name>}`, sections `\label{sec:<name>}` and equations

`\label{eq:<name>}`.

Then when cross-referencing, use `\cref{<type>:<name>}` (or `\Cref{<type>:<name>}` when used at the beginning of a sentence)

Appendix

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