

1 Declaration

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

7 Student:

Date:

8 Signature:

9 Student:

Date:

10 Signature:

11 Student:

Date:

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13 **Abstract**

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21 **Acknowledgment**

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1 Introduction and Motivation

1.1 Problem statement

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1.2 Project significance

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1.3 Project objectives

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2 Background and Related Work

2.1 Background

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2.2 Related work

2.2.1 Drone's visitation of mobile targets

One of the essential ideas of the project is navigating and tracking the objects while minimizing the required time to detect all targets. This is a critical idea as the efficiency of any algorithms or project is always judged based on time and resource usage. Various methods and approaches were studied and implemented in previous research papers with different constraints and goals in mind. As most of the drones have a low battery life, and consequently low flying time. The time constraint was a major limitation for most of the previous research papers. Some authors considered other factors such as the quality of data communication (i.e. throughput, latency, etc) between the command/control system and the drone. The methodology and algorithm in each paper was different as some of them used AI related algorithms while others relied on heavy mathematical calculations to determine the best path.

In paper [3], the authors Huang, Savkin, and Li addressed a problem of autonomous navigation of unmanned aerial vehicles. They proposed a reactive real-time sliding mode control algorithm that navigates a team of communicating unmanned aerial vehicles (UAVs). The drones were equipped with ground-facing video cameras, towards moving targets. Furthermore, they adopted the Voronoi partitioning (VP) technique to reduce the range of movement for each UAV and minimize the revisit time of each target as each drone was responsible for a sub-area. They also ran extensive computer simulations using matlab. Their simulations were tried on one UAV and multiple UAVs, and they also considered the case where of an uneven ground. Their main findings where that the use of VP technique leads to more computation burden, but can considerably reduce the target revisit time.

In paper [2], authors Peng, Liu, and Zhang studied the idea of taking advantage of UAVs in order to increase the network coverage and execute computing tasks offloaded from multiple devices. The constraints were to minimize the energy consumption of the UAV, and maximize the amount of offloaded bits. Objects on the ground were not stationary and were following a Gauss-Markov movement pattern. Their approach was to apply deep reinforcement learning (DRL) to develop an online path planning algorithm based on double deep Q-learning network (DDQN). Simulations were made to prove the viability of their idea and the effectiveness of the DRL-based path planning algorithm.

In a third paper, Huang and Savkin focused on navigating a team of UAVs equipped with cameras to monitor groups of ground pedestrians or vehicles that were moving with a bounded speed but an unknown pattern. The surveillance is supposed to be from the shortest distances possible. They proposed an algorithm in which the UAV is able to its movement locally with some help from a central station. Simulations were done to prove the algorithm's efficiency. However, the specific simulation software was not mentioned.

All the mentioned papers presented their solutions using different simulation software. However, none of them was implemented in the real-world which questions the reliability of the algorithms.

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 L^AT_EX 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

272 8.2 Figure

273 8.3 Equations

$$E_p = mgh = mg(x_f - x_i) \quad (1)$$

$$E_k = E_t + E_r$$

$$E_t = \frac{1}{2}mv^2 \quad (2)$$

$$E_r = \frac{1}{2}I\omega^2 \quad (3)$$

$$I = \frac{1}{2}MR^2 \quad (4)$$

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

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

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

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

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

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

276 **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

277 **8.5 Table from a csv file**

Table 2: Translational and rotational energies.

m	v_m	E_t	δE_t	E_r	δE_r
kg	m s ⁻¹	J	J	J	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

278 8.6 Graph from a csv file

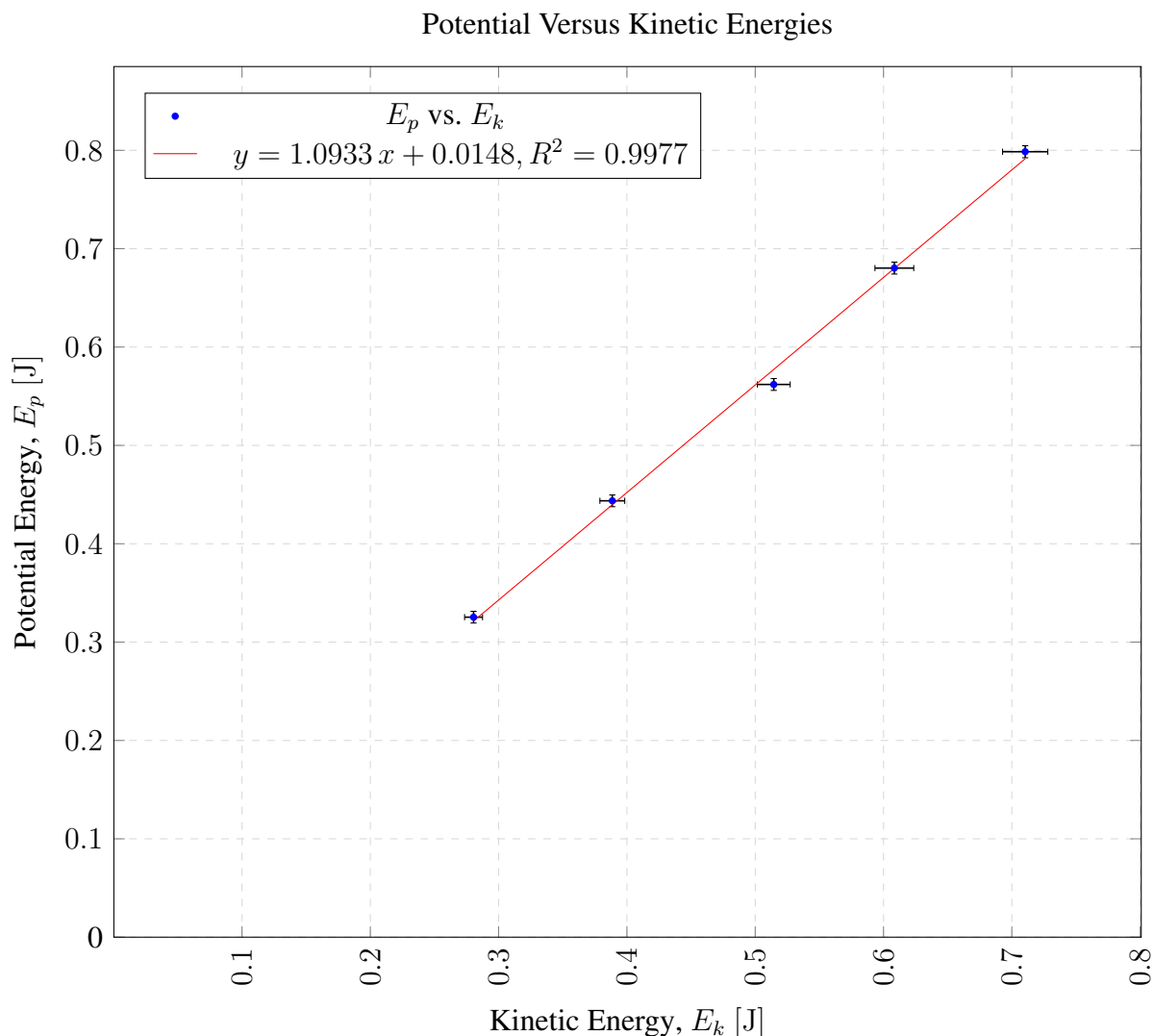


Figure 2: The relationship between potential and kinetic energies.

279 8.7 Citations

- 280 • **in-text citation:** use `\cite{dirac}` to produce [4] or `\textcite{dirac}` to pro-
 281 duce Dirac [4]
- 282 • **citation in parentheses:** `\parencite{knuthwebsite}` produces [5] (for IEEE, this
 283 has no difference to the `\cite{}` command above.)

284 8.8 Cross-references

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

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

288 **Then when cross-referencing, use `\cref{<type>:<name>}`**

289 **(or `\Cref{<type>:<name>}` when used at the beginning of a sentence)**

References

- [1] H. Huang and A. V. Savkin, “Navigating uavs for optimal monitoring of groups of moving pedestrians or vehicles,” *IEEE Transactions on Vehicular Technology*, vol. 70, no. 4, pp. 3891–3896, 2021.
- [2] Y. Peng, Y. Liu, and H. Zhang, “Deep reinforcement learning based path planning for uav-assisted edge computing networks,” in *2021 IEEE Wireless Communications and Networking Conference (WCNC)*, IEEE, 2021, pp. 1–6.
- [3] H. Huang, A. V. Savkin, and X. Li, “Reactive autonomous navigation of uavs for dynamic sensing coverage of mobile ground targets,” *Sensors*, vol. 20, no. 13, p. 3720, 2020.
- [4] P. A. M. Dirac, *The Principles of Quantum Mechanics*, ser. International series of monographs on physics. Clarendon Press, 1981, ISBN: 9780198520115.
- [5] D. Knuth. “Knuth: Computers and typesetting.” (), [Online]. Available: <http://www-cs-faculty.stanford.edu/~uno/abcde.html>.

303 Appendix

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