



UNIVERSITI TEKNOLOGI MARA
CAWANGAN TERENGGANU

MEC299

**Development and Kinematic Analysis of
Catapult Based on Different Ball Weight Parameter**

IKHWAN BIN HASFIZAL

2020617284

SUPERVISOR:

SIR HAIZUAN BIN ABD. RAHMAN

ABSTRACT

This project involves designation, fabrication, simulation, and calculation of projectile launcher that exhibits horizontal projectile motion. To make a catapult, designation and brainstorming need to be done first. Then, final design will be generated into 3D shape using SolidWorks. Then, the final design will be fabricated using material collected at UiTM facilities and workshop. Once finished, it will be tested to its performance to ensure objectives set for this project are achieved. Based on the title, displacement, initial velocity, and time taken will be determined using three different balls with different weights.

TABLE OF CONTENTS

1.0 – Introduction	1
1.1 – Background of Study	1
1.2 – Problem Statement.....	2
1.3 – Objectives.....	2
1.4 – Scope of Work.....	2
1.5 – Expected Results.....	3
2.0 – Literature Review	4
2.1 – Projectile motion.....	5
2.1.1 – Concept of projectile motion.....	5
2.1.2 – Past research preview.....	6
2.1.3 – Comparison between designs.....	8
2.2 – Formula.....	10
2.3 – Applications of projectile motion.....	12
3.0 – Methodology	15
3.1 – Flowchart.....	15
3.2 – Preliminary Results.....	18
3.3 – Gantt Chart.....	19
4.0 – References (IEEE/APA Format)	20

CHAPTER 1

INTRODUCTION

1.0 – Introduction

This project involves development and analysis of an instrument for projectile launcher experiment. The instrument presented as projectile motion demonstration, highlighting each features. Three different balls will be used as launching objects for this experiment. Those are ping pong ball, tennis, and golf ball.

1.1 – Background of Study

This project is focused on projectile motion applications in daily life. As for the product, it is an adaptation of catapult from Greek and Roman artillery. This project will be using the concept of kinematic analysis and launches the cotton ball with different ball weight parameters into the air with the options of angle and time taken. Figure 1.1 below shows a diagram of how kinematic analysis works.

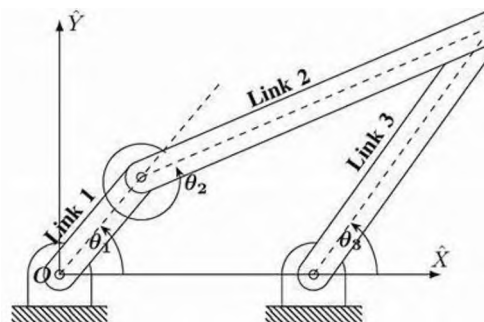


Figure 1.1 – Kinematic diagram

1.2 – Problem statement

Dynamics has proven to be a difficult subject.[1] Students only studied its theories since they don't have a model prototype that is already fabricated for them. So, the goal of this project is to design a model prototype of catapult to simulate the concept of Dynamics which is called projectile motion. Element of success for this project by accuracy of displacement of three different balls with different weights from different angles of shots.

1.3 – Objectives

The main objectives of this project are:

1. To design a catapult using CAD software which is SolidWorks.
2. To fabricate a catapult that works using projectile motion application.
3. To simulate and calculate kinematic analysis using projectile motion application.

1.4 – Scope of Work

Scope of work for this project is to study out kinematic analysis, but the study is limited to projectile motion. After that, designation and fabrication made that will focus on catapult based design. Then, simulation will be made through SolidWorks. Three different variety of balls with different weights, ping pong, tennis, and a golf ball, will be used as launching objects.