Centripital Force

Yiyang Gao

February 20, 2020

1 Aim

The aim is to study circular motion.

2 Apparatus

See lab sheet.

3 Procedure

See lab sheet.

4 Data Collection

Optimization on Apparatus We have cut a very small hole on the tube to make the string generate a 'tick' sound everytime it passes that point, giving us a better sense of the string.

Usage of Computer Program We have programmed a simple Python program to help us timing the revolutions, which we can just hit [enter] once we heard the tick.

```
import time
results = []
last = 0
while True:
  if input("[enter]: next; q: quit > ") == "q": break
  if last != 0: results.append(time.time() - last)
  last = time.time()
print("delta time (seconds) between ticks")
[print(result) for result in results]
```

Table 1: Data

r radius (m)	v velocity ($\mathrm{m\,s^{-1}}$)	v^2 velocity squared ($\mathrm{m^2\,s^{-2}}$)
0.1	2.058	4.236
0.2	3.082	9.496
0.3	3.813	14.536
0.4	3.884	15.085
0.5	5.066	25.664
0.6	5.065	25.652
0.7	5.877	34.535
0.8	6.166	38.014

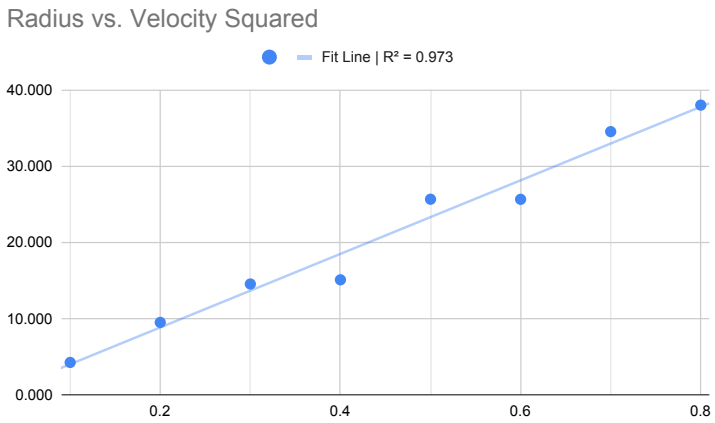

Figure 1: r vs. v^2

5 Data Analysis

As observed in the graph, r and v^2 is having a linear relationship. Specifically, as r increases, v^2 is increasing in a n expotential rate, indicating v is increasing in a logrithmetic rate. Such experiment result proves theory $v^2 \propto r$.

Error Analysis

The error in this experiment may occur in several ways, specifically:

- The change on the tube may cause energy loss during rotation which may lead to a smaller velocity than it should be.
- The length of the string is difficult to kepe because of the fact that the tape is difficult to keep its position on the string, thus may lead to the change of string length.

6 Conclusion

We experimentally proved $v^2 \propto r$.