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Department Automotive and Engine

DESIGN AN ALGORITHM TO ADJUST FUEL INJECTION ANGLE AND INJECTION TIME BASED ON MOTORCYCLE ENGINE SPEED

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A. INTRODUCTION

- **Electronic fuel injection systems for motorcycles have been widely used.**
- **The fuel system using the carburetor replace by the electronic fuel injection system.**
- **The ECU adjust amount of fuel and injection timing base on engine speed.**

B. ALGORITHMS

1.Timing Diagram

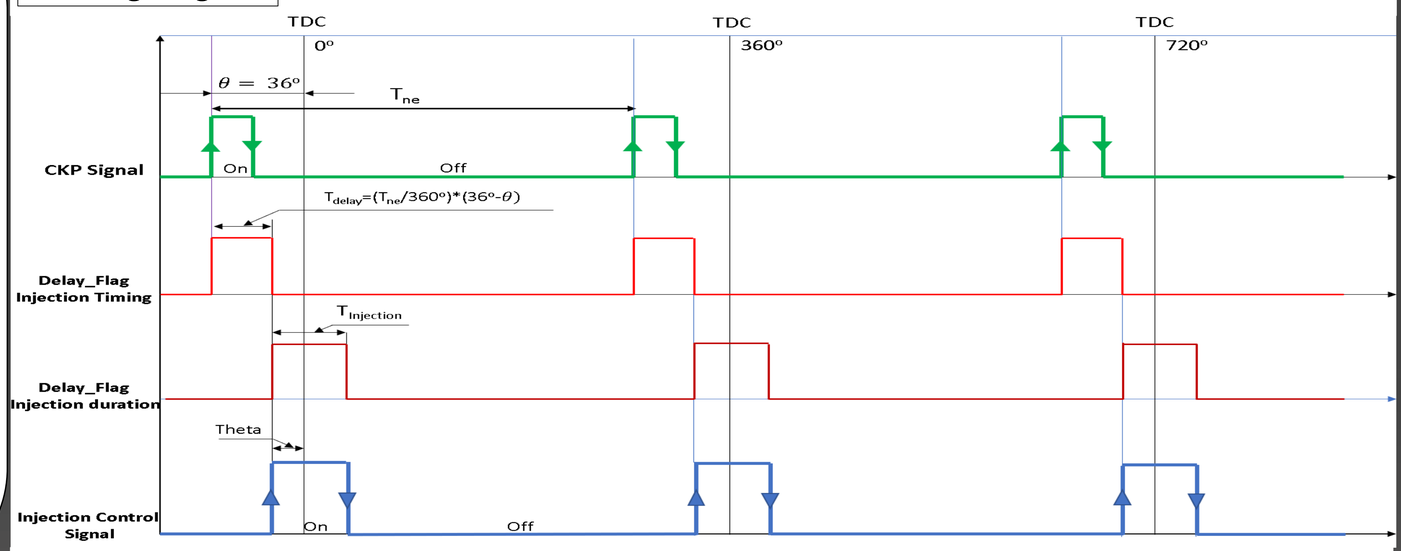

Figure 2.1: Timing diagram of the program

1. General information

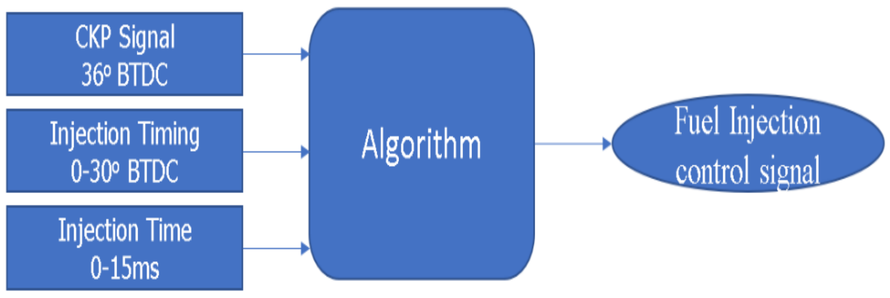

Figure 1.1: Pictorial diagram showing the aim of the project

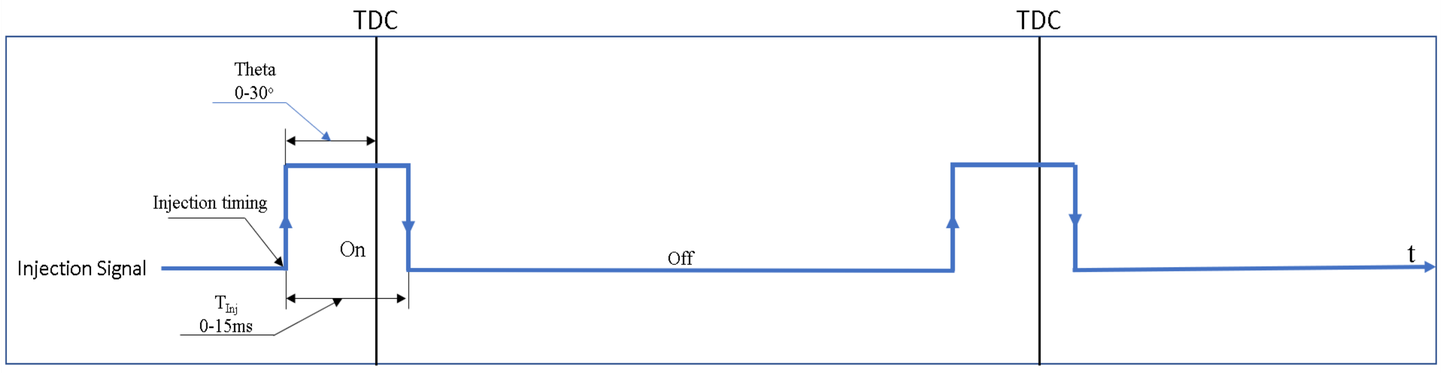

Figure 1.2 Fuel Injection Control Signal

2. Wiring diagram

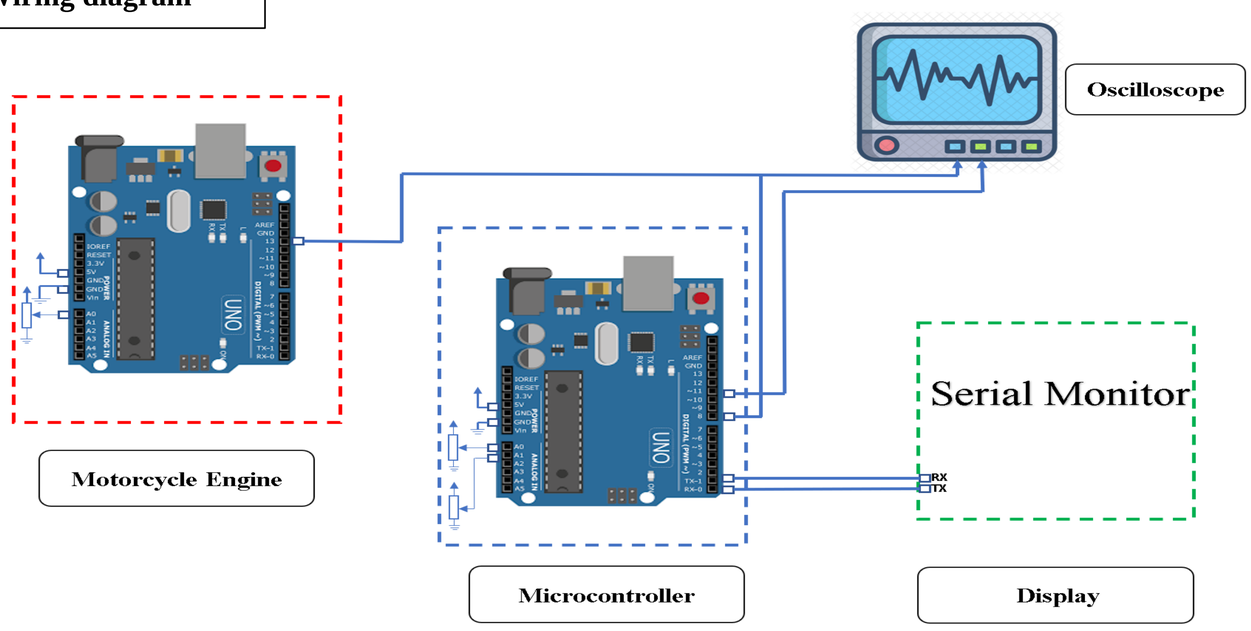

Figure 1.3: Wiring diagram

3. Working principle

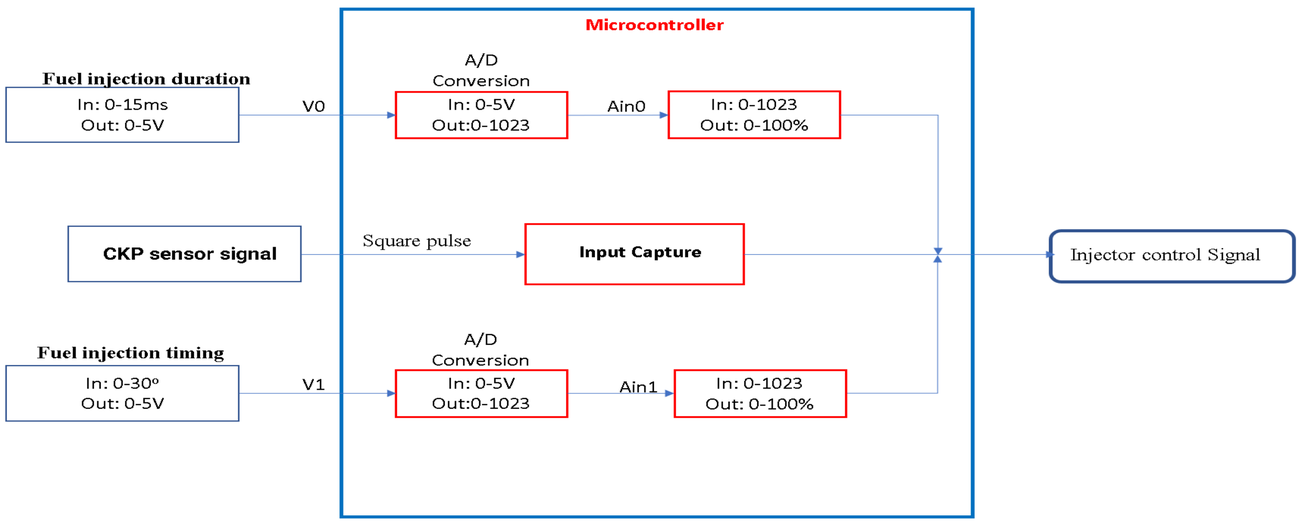

Figure 1.4: Principal diagram

2. Algorithm

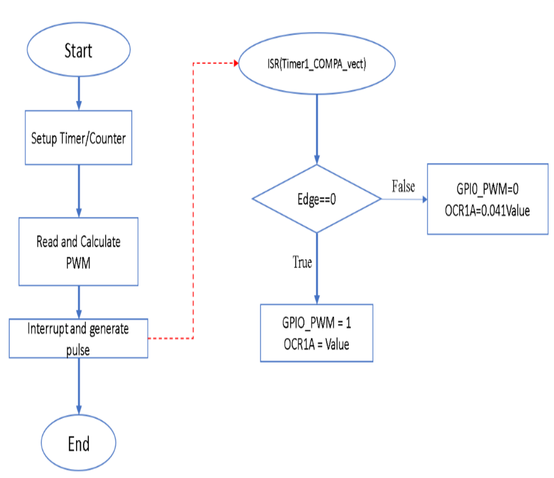

Figure 2.2 Algorithm for speed signal generator program

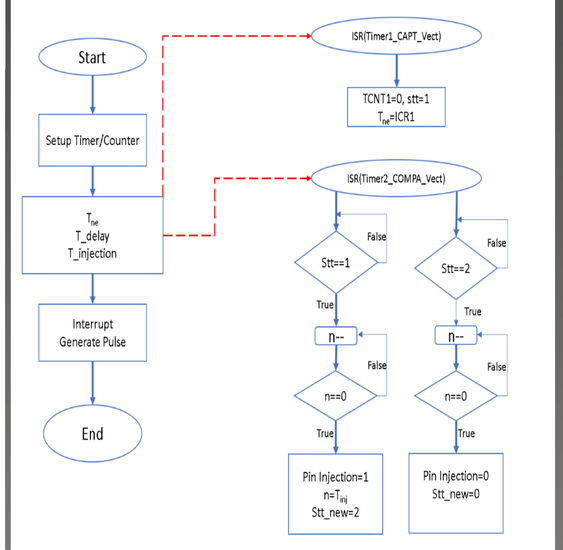

Figure 2.3. Algorithm for fuel injector control program

C. SIMULATION AND RESULTS

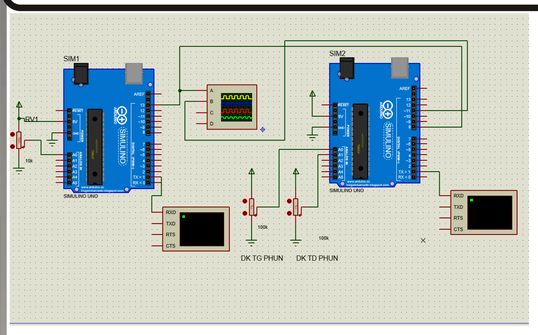

Figure 3.1: Electrical diagram in Proteus

1. Simulation:

The simulation will depend on the electrical diagram to check the result:

1) **An input signal change continuously from 0-100% like the CPK signal at pin A0.(Board Arduino 1).**
2) **2 input signal change continuously from 0-100% like Injection duration (0-15ms) and Injection timing (0-30°BTDC).(Board Arduino 2).**
3) **Pin TXD on Arduino is connected to pin RXD on Virtual Terminal to display value of three signals engine rotation period, injection timing and injection duration**

2. Cases of the algorithm:

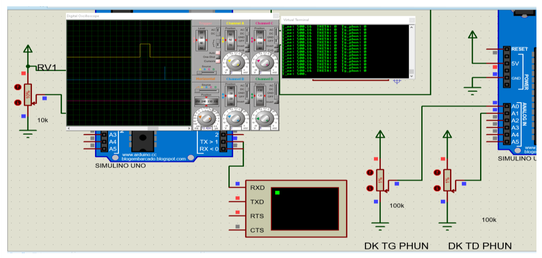

Figure 3.2: Speed at 120RPM, Injection timing at TDC, Injection time is 0 ms

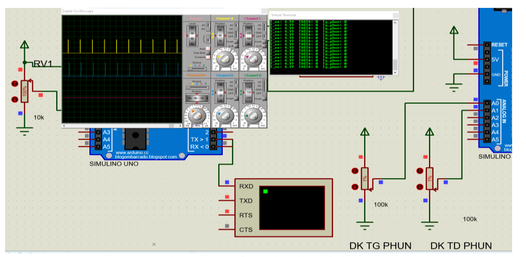

Figure 3.3: Speed at 12000RPM, Injection timing at TDC, Injection time is 0 ms

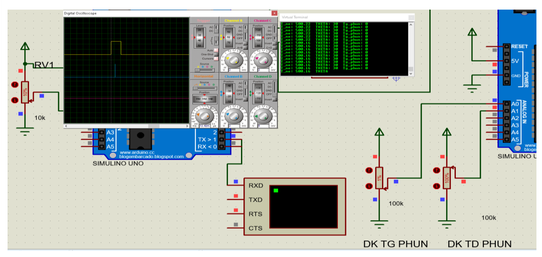

Figure 3.4: Speed at 120RPM, Injection timing at 30° BTDC, Injection time is 0 ms

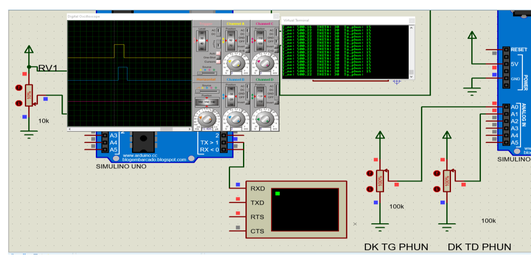

Figure 3.5: Speed at 120RPM, Injection timing at 30° BTDC, Injection time is 15 ms

D. Conclusion

1) **The algorithm has accurately determined the time to open the injector and adjusted the desired fuel injection timing.**
2) **Fuel injection time is in accordance with the engine's rotation period**
3) **Because the program takes some time to stabilize. So, when adjusting the injection timing and injection duration, the results displayed on the screen will be delayed (about 1 second).**