Design & Development of Small Conveyor System for precise Motion Control

Abstract:

This academic project involves the design and development of a **compact conveyor system** with a **belt width of 35 cm** and **belt length of 4 cm**, driven by a **stepper motor** for precise motion control. The system is controlled by a **PIC18F series microcontroller**, which generates the required pulse signals to operate the stepper motor with high positional accuracy.

The key focus of the project is to understand and implement **precision motion control principles** in industrial conveyor applications. The use of stepper motors enables accurate control over speed, direction, and distance of material movement on the conveyor. The microcontroller-based control system allows integration with sensors and external commands for intelligent operation.

This setup acts as a foundational model for more advanced automation systems and serves as a valuable learning tool for students in both **mechanical and mechatronics engineering** domains.

Block Diagram:
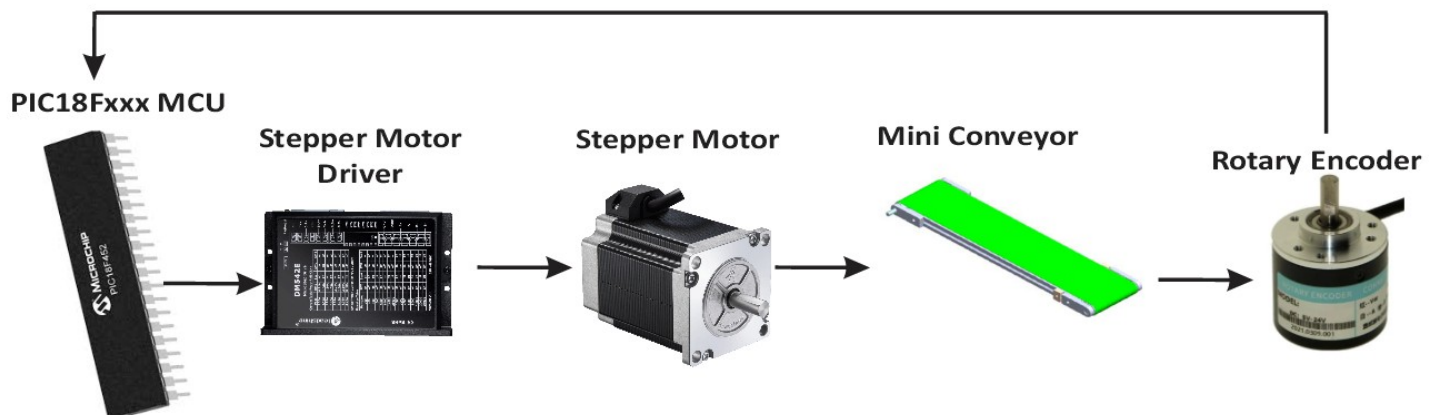
System Architecture:

- **Mechanical System:** Custom conveyor with 35 cm belt width and 4 cm belt length
- **Drive Motor:** Stepper Motor (e.g., NEMA 17/23)
- **Motor Driver:** Leadshine DM542E or equivalent
- **Controller:** PIC18F452 Microcontroller
- **Power Supply:** 24V DC for motor and 5V regulated for MCU
- **Control Interface:** Pushbuttons / optional HMI for speed and direction control

Applications:

- Educational models for motion control systems
- Prototype for automated packaging, sorting, and material handling
- Feeder systems in pick-and-place automation setups
- Lab-scale model for research in industrial automation

Advantages:

- **Cost-Effective Educational Tool:** Provides practical exposure to motion control without costly PLCs
- **Precision Control:** Stepper motor allows high-resolution movement
- **Expandable Architecture:** Can be integrated with sensors, HMIs, or communication modules
- **Multidisciplinary Learning:** Combines mechanical design with embedded system programming
- **Real-World Relevance:** Mimics the functioning of industrial conveyor systems used in automation, manufacturing, and logistics

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