Stick Sorter 5000

DTU Elektro Digital Control 31340

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"Stick sorting at its greatest"

What is it

The stick sorter 5000 consists on a conveyor belt, a rotating chute. It also has photodetector sensor used to detect sticks and their lengths.

Features

- Low Error
- Separates 3 sticks lengths
- Records relevant statistical data
- Intuitive Human Machine Interface
- Fast sorting speed
- Customizable stick length setting

Specifications

The chute has a DC motor with a 45:1 gear ratio and the conveyor belt also uses a DC motor to operator but with a 6:1 gear ratio. To get feedback on the current speed of the belt a tachometer is used. An AD and DA converters are used to connect the stick sorter to the controller.

The RTAI (Real Time Application Interface) OS is used to implement the controller, because the system must run in a time critical manner in order to assure that the sticks are sorted correctly. 4 Threads are used in order to control the chute, the conveyor belt, calculate statistics and handle the Computer Human Interface.

Controller

Using the physical specifications of the belt and chute the DC Motor Model is used to find the parameters for both controllers by doing frequency analysis of the transfer function.

The implemented controllers are PD controller for the chute and a PI for the conveyor belt. This allows for a smooth and precise control. The chute controller was implemented in fixed point as to simulate a machine without floating point.

Statistics

The stick lengths are stored in memory so that later, statistics about the sorting are retrieved. Relevant information like how much sticks went into each category and the relative error of each stick compared to the respective category.

Operator Interface

Besides allowing the operator to start and stop the machine it can also be used to change the parameters of the chute and belt regulator. It can also be used to change the speed reference for the conveyor belt and the stick lengths of each category. Finally, it also displays the statistics.

Limitations

For the system to work correctly the speed must be less 100cm/s although faster speeds maybe achievable. The minimum distance between sticks should 5mm in order to be detected correctly but bigger distance should be used in order to give time for the chute to rotate itself properly.