Automation in Complex Systems (EIEN35)
Project description

Project Task

The laboratory conveyor system will be used in the project (see lab manual for Automation MIE080). As an initial state, there are going to be 5 (five) jobs located on the upper conveyor on the left hand side of the block B2. Each job is bar-coded with four bars that are either black or white. Based on the barcode, a unique job number can be assigned to each job. On the upper conveyor, between blocks B2 and B3, there is a photocell sensor system that is used for reading the bar codes to identify individual jobs. Sensors D1, D2, D3, D4 and D5 are used for the identification.

The project task is to implement a program that sort jobs (change their sequence) so that, when the sorting is finished, all jobs appear in an **ascending order (right to left) on the upper conveyor to the left of block B2**. A necessary condition is that the initial sequence of job numbers is assumed to be unknown. The goal is to make the sorting algorithm as efficient as possible, i.e. to minimise the job sorting time. The result for the different projects will be evaluated by comparing the sorting time for a specific job number sequence (chosen by the project supervisor).

Project Outline

The supervisors for the project are: Ramesh Saagi (ramesh.saagi@iea.lth.se)

The project is carried out in groups of 4 students. Our experience from previous years is that the project will require approximately 50 hours of work from each group member. During the project the IEA lab will be available "24/7". Access to computers is possible at all times, but the operations of the equipment is restricted to times when the supervisor is present (scheduled times). In the final stages of the project, computer reservation lists might be needed.

During the project the following are required from each group in order to pass:

- **Supervisor discussion 1 (W13, i.e. 26-30/3).** During this discussion the group should present their ideas about what methods to use in order to solve the problem.
  A brief project plan should also be presented/submitted (1-2 pages), containing:
  - The division of work in the project among the team members
  - Timetable with goals and scheduled work hours for each study week
- **Milestone 1 (W17, i.e. 23-27/4).** At this point, basic program functions should be implemented (and possibly, optimization of the sorting process could be started). This discussion will be carried out in the lab with each group.
- **Supervisor discussion 2 (W19, i.e. 7-11/4).** By this stage, all the programs needed to implement at least a simple sorting algorithm should be tested/or testing in progress.
  A brief status report should be submitted (1 page), containing:
  - The current status of the work in the group: what is implemented and tested
  - The work that is left to be done
- **Final demonstration at the end of W21 (21/5).** The project will be demonstrated and tested on 21st May (Monday). A brief presentation (~5-10 min) of the project is mandatory. Representatives from all groups must be present. A final report (approx. 3-4 pages) must be submitted the day before the demonstration (i.e. latest **20/5**), containing:
  - Summary of the report
  - Introduction (i.e. description of the task)
  - Method and program structure
  - Results and discussion (e.g. problems/solutions)

    } the program
  - Project evaluation, i.e. the project execution contrasted against the project plan (e.g. planned amount of time against actual required time for a given task)
  - Difficulties and achieved knowledge/experience for the project as a whole

    } the project
- **The program must be able to sort 5 jobs in ascending order, with any given initial order, in a robust and safe manner.**

The projects will finally be discussed on the lecture Wednesday **May 23**

Good luck with your projects!