Software Specification

11th of March 2015

2IO70

Version 1.0

The purpose of this document is to give an as accurately as possible description of the required behaviour of the PP2, without describing how this is achieved, and a UPPAAL model of this behaviour. In order to do this, we translate the system level requirements to a high level specification of what the software controlling the physical machine should do.

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Table of Contents

Inputs and Outputs

Inputs

[Insert table of inputs to the program]

Outputs

[Insert table of outputs from the program]

Relations

Lens lamp of the black white detector

The lens lamp of the black white detector will go on when the disc is expected at the sensor. We can calculate when we expect a disc according to the speed of the conveyer belt and the input of the photo transistor of the position sensor. The lens lamp goes on when the timer hits calculates time of arrival.

Lens lamp of the position sensor

The lens lamp of the position sensor reacts only to the "START/STOP" button and the "ABORT" button. The lens lamp will be on after the "START/STOP" button is pressed and the machine is in its resting state. If at any other point in time the "ABORT" button is pressed it will go off. When the "START/STOP" button is pressed and the machine is running then the lens lamp also goes off.

Engine of the conveyer belt

The engine of on the conveyer belt only reacts to the input of the "START/STOP" button and the "ABORT" button. The engine will start when the machine is in its resting state and the "START/STOP" button is pressed. If however the "START/STOP" button is pressed and the machine is not in its resting state then the machine will stop after it completed its current cycle. Whenever the "ABORT" button is pressed the engine stops within 50ms.

Engine of the feeder

The engine for the feeder also only reacts to the input of the "START/STOP" button and the "ABORT" button. This engine also starts when the machine is in its resting state and the "START/STOP" button is pressed. If however the machine is running then the engine will stop. When the "ABORT" button is pressed the engine stops within 50ms.

Engine for the sorter

When the machine is running the engine of the sorter reacts to inputs of the colour detector, the push sensor and the timer. When a signal is received from the colour detector the engine pulls the sorter down, the engine then waits until the timer gives a signal to go up again as to let disks

through, it knows when it is in the correct “up” position from the push sensor . If the “START/STOP” button is pressed when the machine is in its resting state, then the sorter will wait for a signal from the timer that marks the end of the current cycle. If at any time the ““ABORT”” button is pressed, the sorting mechanism is to stop within 50ms.

Display for counting

The display output depends on how many times the colour detector detects a white disc and how many times a disc passes the position sensor without the colour detector detecting it.

In the initial state the counters get reset.

Description of States

Initial state

Outputs	Value for output
Lens lamp position	0
Lens lamp sorter	0
Engine conveyer	0
Engine feeder	0
Engine sorter	1
Display	0
LED state indicator	0
Timer start	0

Resting state

Outputs	Value for output
Lens lamp	0
Lens lamp	0
Engine conveyer	0
Engine feeder	0
Engine sorter	0
Display	0
LED state indicator	1
Timer start	0

Running state

Outputs	Value for output
Lens lamp position	1
Lens lamp sorter	1
Engine conveyer	1
Engine feeder	1
Engine sorter	0
Display	0
LED state indicator	0
Timer start	2 + Belt

Timer Start (Ru, SS = 1)

Outputs	Value for output
Lens lamp position	1
Lens lamp sorter	1
Engine conveyer	1
Engine feeder	1
Engine sorter	0
Display	0
LED state indicator	0
Timer start	Belt

Running State 2

Outputs	Value for output
Lens lamp position	1
Lens lamp sorter	1
Engine conveyer	1
Engine feeder	1
Engine sorter	0
Display	0
LED state indicator	0
Timer start	0

Running State 3

Outputs	Value for output
Lens lamp position	1
Lens lamp sorter	1
Engine conveyer	1
Engine feeder	1
Engine sorter	0
Display	0
LED state indicator	0
Timer start	2 + Belt

Motor Up

Outputs	Value for output
Lens lamp position	1
Lens lamp sorter	1
Engine conveyer	1
Engine feeder	1
Engine sorter	1
Display	0
LED state indicator	0
Timer start	Sort

Motor Up 2

Outputs	Value for output
Lens lamp position	1
Lens lamp sorter	1
Engine conveyer	1
Engine feeder	1
Engine sorter	1
Display	0
LED state indicator	0
Timer start	Sort

Motor Down

Outputs	Value for output
Lens lamp position	1
Lens lamp sorter	1
Engine conveyer	1
Engine feeder	1
Engine sorter	1
Display	0
LED state indicator	0
Timer start	Sort

Motor Up’

Outputs	Value for output
Lens lamp position	0
Lens lamp sorter	1
Engine conveyer	1
Engine feeder	0
Engine sorter	1
Display	0
LED state indicator	0
Timer start	Sort

Motor Up 2'

Outputs	Value for output
Lens lamp position	0
Lens lamp sorter	1
Engine conveyer	1
Engine feeder	0
Engine sorter	1
Display	0
LED state indicator	0
Timer start	Sort

Motor Down ’

Outputs	Value for output
Lens lamp position	0
Lens lamp sorter	1
Engine conveyer	1
Engine feeder	0
Engine sorter	1
Display	0
LED state indicator	0
Timer start	Sort

Timer Start

Outputs	Value for output
Lens lamp position	1
Lens lamp sorter	1
Engine conveyer	1
Engine feeder	1
Engine sorter	0
Display	0
LED state indicator	0
Timer start	0

Timer Start 2 (SS = 1)

Outputs	Value for output
Lens lamp position	0
Lens lamp sorter	1
Engine conveyer	1
Engine feeder	0
Engine sorter	1
Display	0
LED state indicator	0
Timer start	Belt

Aborted (A)

Outputs	Value for output
Lens lamp position	0
Lens lamp sorter	0
Engine conveyer	0
Engine feeder	0
Engine sorter	0
Display	0
LED state indicator	0
Timer start	0

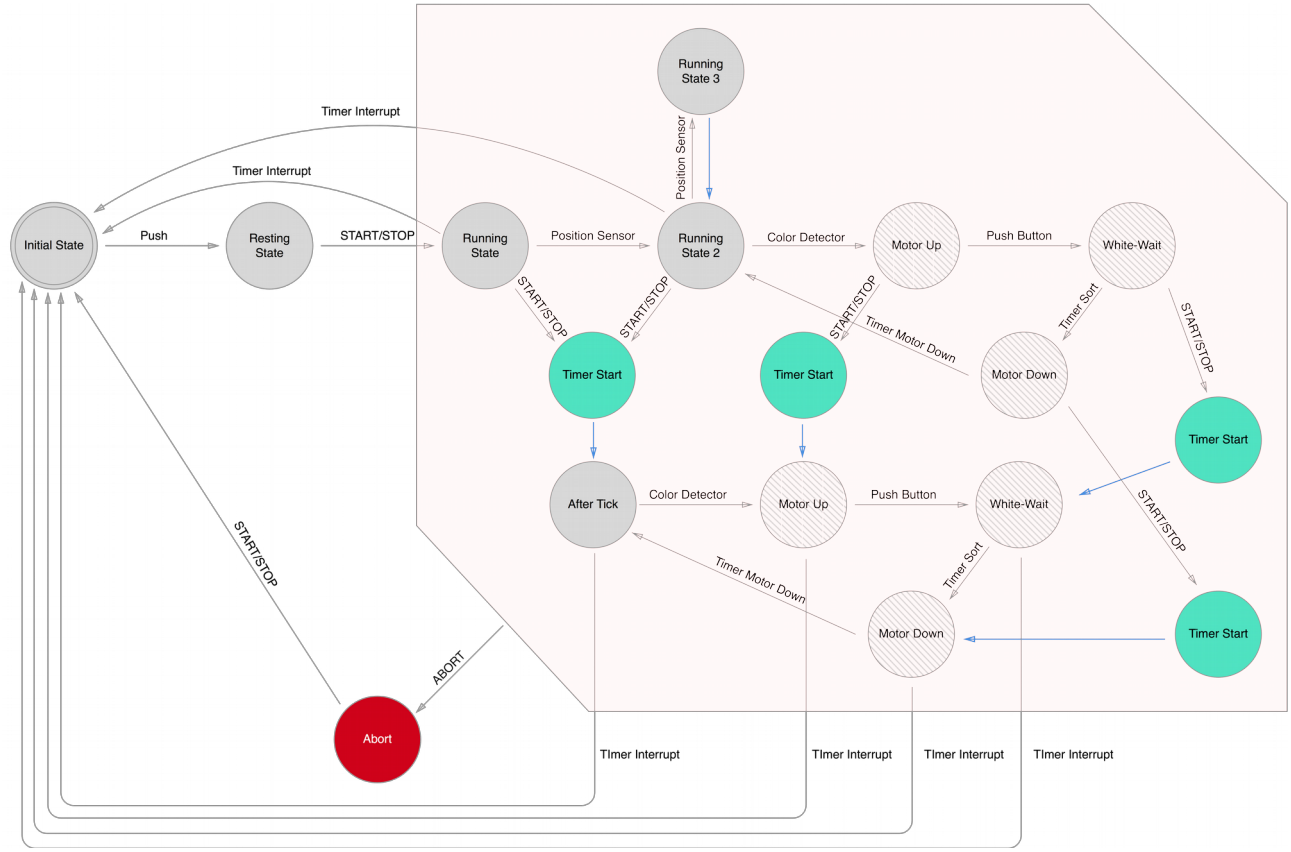
After tick

Outputs	Value for output
Lens lamp position	1
Lens lamp sorter	1
Engine conveyer	1
Engine feeder	1
Engine sorter	0
Display	0
LED state indicator	0
Timer start	Belt

State transitions

Current state	Input	Input value	Next State
Initial	Push	1	R
Resting	StartStop	1	Ru
Running	Timer	TEnd	I
Running	PS	1	Ru2
Running	Abort	1	A
Running	StartStop	1	TimS
Running2	Timer	TEnd	I
Running2	PS	1	Ru3
Running2	CD	1	MU
Running2	StartStop	1	TimS
Running2	Abort	1	A
Running3	Tic	1	Ru2
MotorUp	PB	1	MU2
MotorUp	StartStop	1	TS2
MotorUp2	StartStop	1	TS2
MotorDown	StartStop	1	TS2
MotorUp	Abort	1	A
MotorUp2	Abort	1	A
MotorDown	Abort	1	A
MotorUp2	Timer	SORT	MD
MotorDown	Timer	Motor Down	Ru2
MotorUp’	PB	1	MU2’
MotorUp’	Abort	1	A
MotorUp2’	Timer	SORT	MD’
MotorUp2’	Abort	1	A
MotorDown’	Timer	Motor Down	After tick
MotorDown’	Abort	1	A
TimerSet	Tic	1	After tick
After tick	CD	1	MU’
After tick	Abort	1	A
After tick	Timer	TEnd	I
TimerSet2	Timer	Tic	MU’
Aborted	StartStop	1	I

Finite state Automaton



UPPAAL model

[Insert UPPAAL model here]

Validation and Testing

[Insert validation and testing here]