LaTeX Report Template – Full Demo

Readme

2 things: see blank template at very end of PDF! – also, see comment in `main.tex`

Math

Matrices

$$\begin{cases} \dot{m}_1 + \dot{m}_2 = \dot{m}_e \\ \dot{m}_1 h_1 + \dot{m}_2 h_2 = \dot{m}_e h_e \\ \dot{m}_e s_e - \dot{m}_1 s_1 - \dot{m}_2 s_2 = \dot{S}_{\text{gen}} \end{cases}$$

$$\Downarrow$$

$$\begin{cases} (1)\dot{m}_1 + (1)\dot{m}_2 + (0)\dot{S}_{\text{gen}} = (\dot{m}_e) \\ (h_1)\dot{m}_1 + (h_2)\dot{m}_2 + (0)\dot{S}_{\text{gen}} = (\dot{m}_e h_e) \\ (-s_1)\dot{m}_1 + (-s_2)\dot{m}_2 + (-1)\dot{S}_{\text{gen}} = (-\dot{m}_e s_e) \end{cases}$$

$$\Downarrow$$

$$\text{rref}\left(\begin{array}{ccc|c} 1 & 1 & 0 & 5 \\ h_1 & h_2 & 0 & 5 \times 293.07 \\ s_1 & s_2 & 1 & 5 \times 0.9551 \end{array}\right)$$

$$=$$

$$\left(\begin{array}{ccc|c} 1 & 0 & 0 & \dot{m}_1 \\ 0 & 1 & 0 & \dot{m}_2 \\ 0 & 0 & 1 & \dot{S}_{\text{gen}} \end{array}\right)$$

where $\dot{m}_1$, $\dot{m}_1$, and $\dot{S}_{\text{gen}}$ are resolved

Align

$$\begin{aligned} s\left(120^\circ\text{C}, 101.325\text{ kPa}\right) &= \text{map}(0.10\text{ MPa}, 0.101325\text{ MPa}, 0.20\text{ MPa}, \\ &\quad s\left(120^\circ\text{C}, 0.10\text{ MPa}\right), s\left(120^\circ\text{C}, 0.20\text{ MPa}\right)) \\ &= \text{map}(0.10\text{ MPa}, 0.101325\text{ MPa}, 0.20\text{ MPa}, \\ &\quad \text{map}(100^\circ\text{C}, 120^\circ\text{C}, 150^\circ\text{C}, \\ &\quad 7.3611\text{ kJ/kg·K}, 7.6148\text{ kJ/kg·K}), \\ &\quad \text{map}(120.21^\circ\text{C}, 120^\circ\text{C}, 150^\circ\text{C}, \\ &\quad 7.1270\text{ kJ/kg·K}, 7.2810\text{ kJ/kg·K})) \\ &= 7.4589\text{ kJ/kg·K} \end{aligned}$$

Derivation of Formulas for Outputs

Derive formula for θ from system of intuitive equations for t_f and x_f:

$$\begin{cases} t_f = 2g^{-1}v_i \sin\theta \\ x_f = t_f v_i \cos\theta \end{cases}$$

$$\Downarrow$$

$$x_f = 2g^{-1}v_i \sin\theta v_i \cos\theta$$

$$\Downarrow$$

$$x_f = g^{-1}v_i^2 2\sin\theta\cos\theta$$

$$\Downarrow$$

$$x_f = g^{-1}v_i^2 \sin(2\theta)$$

$$\Downarrow$$

$$\theta = 0.5\sin^{-1}\left(x_f g v_i^{-2}\right) \tag{1}$$

t_f and $y_{\max}$ in terms of inputs and priors:

$$t_f = 2g^{-1}v_i \sin\theta \tag{2}$$

$$y_{\max} = 0.25 t_f v_i \sin\theta \tag{3}$$

Sine Approximation

Bhaskara I's sine approximation formula:

$$\sin x \approx \text{Bhaskara}(x) = \frac{4x\,(180 - x)}{40500 - x\,(180 - x)}$$

Inverse (domain: $0 \le y \le 1$, range: $0 \le x \le 90$):

$$\sin^{-1} y \approx \text{Bhaskara}^{-1}(y) = \frac{90\left(y - 2\sqrt{-y^2 - 3y + 4} + 4\right)}{y + 4}$$

Square root computed in MARS MIPS using `sqrt.s` pseudoinstruction. Accuracy of approximation best for $30 \le \theta \le 90$.

Tables

Especially useful for documenting variable names. `multirow` command to merge cells.

Table 1: Variables correspondence

Symbol	MIPS Register	Python Variable
g	`$f1`	`G`
v_i	`$f2`	`VI`
x_f	`$f3`	`XF`
θ	`$f4`	`THETA`
t_f	`$f5`	`TF`
$y_{\max}$	`$f6`	`YMAX`
Bhaskara(θ)	`$f7`	n/a

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Table 2: System of equations resolved for the four source pairings

Sources Used				$\dot{m}_1$ (kg/s)	$\dot{m}_2$ (kg/s)	$\dot{S}_{\text{gen}}$ (kJ/K)
1	2	3	4			
X		X		1.671	3.329	0.1178
X			X	4.603	0.397	0.4476
	X	X		2.782	2.218	0.0441
	X		X	4.833	0.167	0.1284

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Table 3: Variables explanation

MIPS Register	Python Variable	Meaning
`$s0`	`MAX`	upper bound
`$s1`	`FACTOR_1`	first factor
`$s2`	`FACTOR_2`	second factor
`$s3`	`SUM`	running sum of multiples, outputted at end
`$t0`	`TEST`	# in set to test for divisibility, iterated from 1 to `MAX`

Figures

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Listing

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Your Name
EE-2063-01: Comp Org/Microprocess
May 9, 2019

UTulsa ECE Report Template

Objective

Nam quis enim. Quisque ornare dui a tortor. Fusce consequat lacus pellentesque metus. Duis euismod. Duis non quam. Maecenas vitae dolor in ipsum auctor vehicula. Vivamus nec nibh eget wisi varius pulvinar. Cras a lacus. Etiam et massa. Donec in nisl sit amet dui imperdiet vestibulum. Duis porttitor nibh id eros.

Introduction

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Tools Used

- Python 3.7.2
- MARS (MIPS Assembler and Runtime Simulator) Release 4.5
- MATLAB with Simulink
- Circuits lab
- Typeset with LaTeX

Method

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Results

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Conclusion

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