ELANCHEZHIAN TAMILSELVAM

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Job Responsibility / Role

Development of products using Thermal and Electrical Modelica libraries, carrying out projects (collaborating with customers), and providing support to different team (solving their problems) using the following skills/activities:

1. **Developing the Thermal and Electrical libraries** (Refrigeration System for commercial, Electrical models for the Electric Trailer Refrigerant Unit)
2. **Executing projects** (Focus on Simulation performance improvement using numerical analysis and solver techniques)
3. **Supporting other teams** (Developed 1D model and Digital Twin using Ansys Twin Builder and MATLAB-Simulink, Explored the OPC UA techniques)

Work Experience - 6 Years 6 Months (01 June 2016 to till date)

1. **Trane Technologies Private Limited - 5 months (July 2022 to date)**
   - **Senior Engineer 1D Modeling & Simulation**
2. **Modelon Engineering Private Limited – 5 years (July 2017- June 2022)**
   - **Simulation Engineer II**
   - Thermal Modelica libraries product development, executing engineering service projects (**Collaborate with Customer**), and customer support (**Problem Solving**) using the following expertise/activities:
     i. **Developing and maintaining the Thermal libraries** (Heat Exchanger Library, Liquid Cooling Library, and Vapor Cycle Library)
     ii. **Executing engineering service projects**
     iii. **Handling first line and second line customer support** (Modelica libraries, FMI Technology, and Licensing support)
3. **Pitman Engineering Consultancy Private Limited – 1 year 1 month (June 2016-June 2017)**
   - **Project Engineer**
   - Developing the HVAC-Vehicle model in MATLAB-Simulink, Creating new Python based tool to visualize the Heat Exchanger behaviour.
   - Focused on service projects and customer support with Modelica

Work Profile

- **Development and Project handling using Modelica:**
  - **Thermal Modelica model**– Developed the Low and High fidelity model for refrigeration system, Developed Phase diagram which is applicable for most of the Refrigerant, Implemented new adaptor to support the FMI
  - **Electrical Modelica model** – Developed DC, AC single phase and poly phase power source which will improve the robust of converter, inverter and motor models.
  - **Simulation Performance Improvement** – Analysed the existing Refrigeration system model and improved the simulation performance by 10X using the numerical analysis and solver settings.
- **Modelica - Dymola Trainings:**
  - **Internal training for Modelica - Dymola**– Conducted internal training session hosted by me for a month with 13 different session which is focused from basics of Modelica till the troubleshooting methods and succeed on it
- **Developed Model-Based Systems Engineering (MBSE) models using Modelica language, for:**
  - **Vapor Cycle System Models**– Developed the interfaces, templates, components, and system models using the given requirements and reference paper for the capillary suction line heat exchanger
  - **Vapor Cycle System with Cabin Model** – Developing air path models like a cabin, bypass valve, air duct, and blower
  - **Heat Exchangers Models** – Feature enhancements for Liquid-Air flat tube and Liquid-Gas plate heat exchangers with finned geometry, capillary tube, and suction line heat exchanger
  - **Liquid Cooling Components** – Developing thermostatic four-way valve, two/ three-port check valves
  - **Air Conditioning System** – Modeling phase separator and evaporator calibration models
  - **General Modeling** – Experience in the use of Model-Based System Engineering such as based on the customer needs, developing the interface and system models, documentation, verification, and validation with reference paper

Major Projects

1. **Simulation Performance Improvement for Multi-Temp Refrigeration System (Dymola & MATLAB-Simulink)**
   - *There are 2 problem identified and resolved using numerical analysis and solver settings*
     i. *Reduced the non-linear system and improved the simulation solver settings which improves 5X of simulation speed*
     ii. *Integrated the plant model and container model in Dymola itself instead of MATLAB-Simulink as an FMU. This improved the simulation speed again 5X*

2. **Digital Twin model for Axial fan (Dymola, Ansys Twinbuilder & MATLAB-Simulink)**
    - *There are 3 types of work which we done for this digital twin as follows:*
        i. *Developed axial fan 1D model using the geometric data and identified simple method to find the blade stress and deformation in Dymola*
        ii. *Supported different team to handle the digital twin with Ansys Twin Builder. Mainly focused on communication between Digital twin and physical assert*
        iii. *Heading the lead to replace the Ansys Twin Builder with MATLAB-Simulink with different tool box and also focused on OPC UA technique for the communication between Digital twin and physical assert*
3. **Wastewater Treatment Plant Modeling and Simulation (Dymola)**
    - *The wastewater treatment plant model has been developed by referencing the literature and customer data. The modeling of this system is to study the impact of few controlled variables like steam valve opening, inverter frequency, sealing water temperate, and wastewater flow rate. These models are validated against the measured data provided by the customer.*
4. **An integrated HVAC-Vehicle model is created for climate control studies using MATLAB and Simulink.**
    - *A published lumped parameter-based HVAC model has been used as the framework for the HVAC modeling with some modifications to realize the climate control and to improve the robustness of the model. R134a (1,1,2,2-Tetrafluoroethane) has been used as the refrigerant fluid in this study. The stand-alone HVAC model has been compared qualitatively with the experimental works available in the literature.*
5. **Modeling and simulation work performed on Gas Turbine Fuel Control System using Hydraulics Library**
6. **Electric and Hybrid Vehicle Architectures development (Dymola)**
    - Developed the interfaces, templates, components, and system models based on the electric and hybrid vehicle architectures
7. **Developed Python GUI Tool to visualize the Heat Exchanger behavior**
    - Developed GUI tool using the Python scripting to visualize the Heat Exchanger behavior such as Heat flow path, temperature, pressure, and density changes as a contour plot with animation
8. **Developed Python Jupyter Notebook to debugging the Modeling issues**
    - Developed Python Jupyter Notebook Workflows and Frameworks to debug the Model-Based Systems Engineering models issues. It covers compilation issues, simulation issues (includes non-linearity, system statistics, state selections)
9. **Developed Excel-based automation tool in MATLAB**
    - Developed Excel-based automation tool using MATLAB scripting for simulation and result comparison between Dymola and Simulink

Key Skills

- 1-D Modeling, simulation, and system design (Thermal systems & Electrical models)
- Steady-state analysis and optimization
- Familiar with the Agile methodology (Jira and Azure DevOps)
- Hands-on experience with SVN and Git version control
- Ability to work in a global team
- Undergone advanced Modelica language course
- Undergone Vapor Cycle, Heat Exchanger, and Air Conditioning courses

Software Tool Knowledge

- Hands-on experience on Advanced Modelica, Python scripting, VBA scripting, MATLAB scripting and Julia scripting
- Hands-on experience on Model-Based Systems Engineering (MBSE) Tools like Modelon Impact, Dymola, Open Modelica, MATLAB-Simulink, FMI Technology, Ansys Twin Builder.

Publications

- Multi-objective modeling and analysis of an electric pickup vehicle for range, performance, drivability, handling, and ride comfort attributes, **INCOSE International Symposium**, December 2019
- Model-Based Design and Multi-objective Robust Optimization of Electric Vehicle for Performance, Range and Top Speed Objectives, **Springer**, August 2020

Academics

Degree/Certificate	Institute/University	CGPA/Percentage	Passing Year
Bachelor of Engineering (Aeronautical Engineer)	Bannari Amman Institute of Technology, Sathyamangalam	8.96 / 84.57%	2016
HSC (12^{th})	Tamilnadu Board	87.17 %	2012
SSLC (10^{th})	Tamilnadu Board	74.2 %	2010

Extracurricular Activities

- President of “Trichy Toastmasters Club” Toastmasters International and Toastmaster’s member since 2016.
- Vice president of “Aeronautical Student Council for Transformation” Student Association of Aeronautical Engineering
- Attended 4 Brevets de Randonneurs Mondiaux (BRMs) and completed upto 300 km cycling.

Personal Details

Date of Birth	:	18th November 1994
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