**AUTOMATIC TRANSMISSION CONTROLLER**

Automatic transmission controller is a part of the drivetrain module. This helps in controlling the speed of the vehicle using effective gear shifting. The figure below shows the power flow in an automotive drivetrain.

*Throttle*

**Engine**

**Vehicle**

**Dynamics**

**Transmission Gear Ratio**

**Torque**

**Converter**

*Brake*

**Transmission**

**Control Unit (Stateflow**)

We implement the model as per the basic block diagram above. We will be going for a 4 speed automatic transmission. Here we implemented the model as per the block diagram. Transmission Control unit alone does not go well with differential equations hence we use stateflow representation to implement the gear shifting action.

The rest of the blocks are modelled with Non-linear ordinary differential equations.

1. The throttle opening is one of the inputs to the engine. The engine is connected to the impeller of the torque converter which couples it to the transmission.

**Equation 1:**

1. The input-output characteristics of the torque converter can be expressed as functions of the engine speed and the turbine speed.

**Equation 2:**

1. The transmission model is implemented via static gear ratios, assuming small shift times.

**Equation 3:**

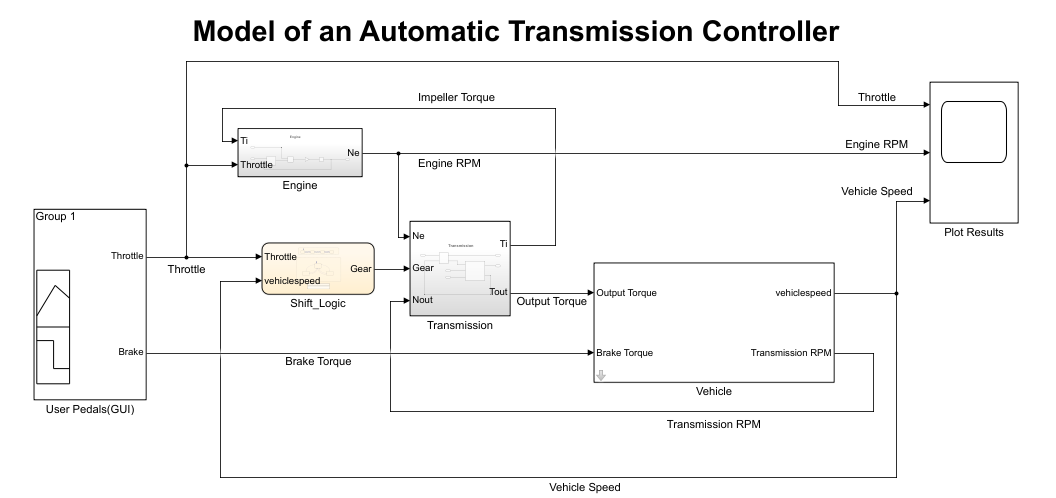
1. The final drive, inertia, and a dynamically varying load constitute the vehicle dynamics.

**Equation 4:**

1. The load torque includes both the road load and brake torque. The road load is the sum of frictional and aerodynamic losses.

**Equation 5:**

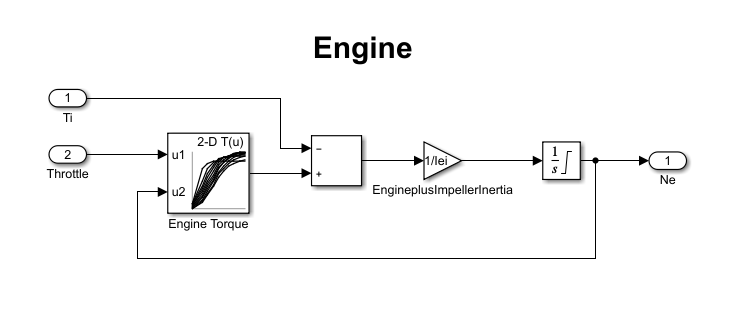
**Simulink Model :**



This is the model of Automatic Transmission Controller implemented in the Simulink model file.

**Engine Subsystem**

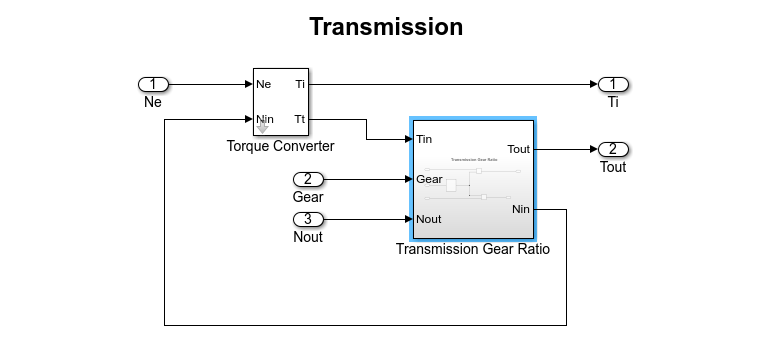
This takes the inputs Throttle and Impeller torque and gives the output of engine RPM.



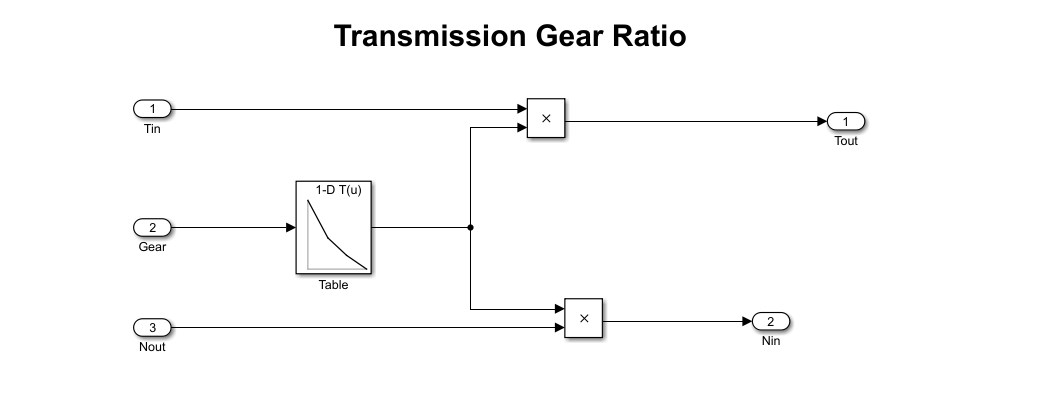
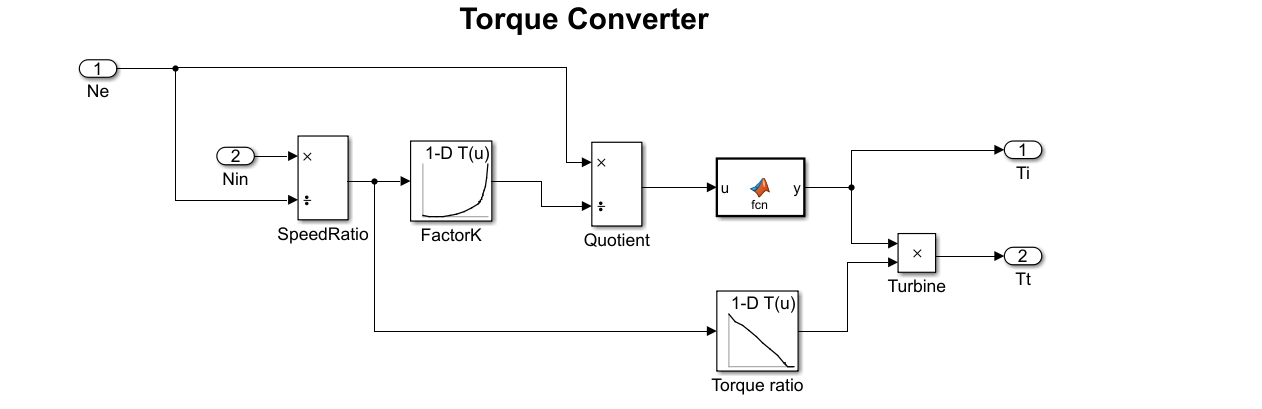
**Transmission Subsytem**

This module is divided into two other subsystems

* Torque Converter
* Transmission Gear Ratio

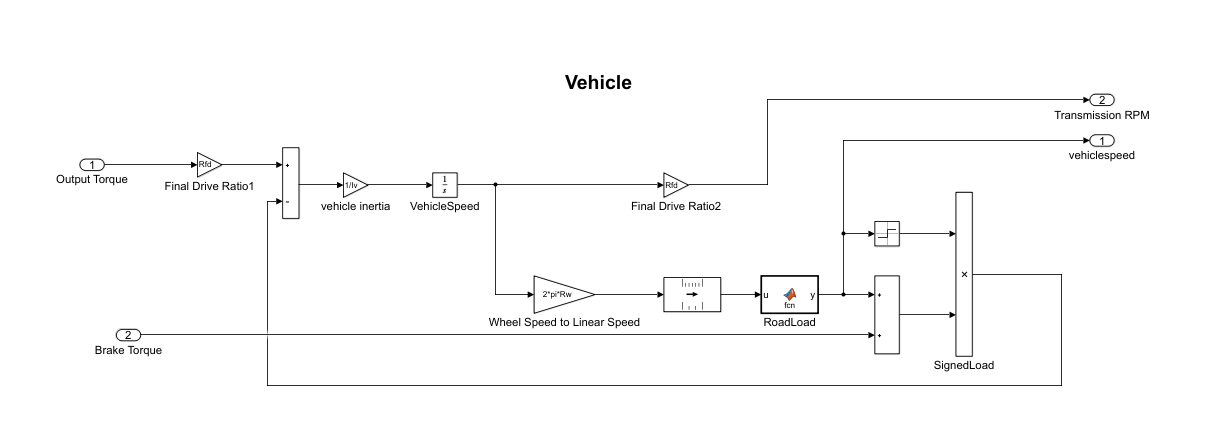


This takes the input of engine speed , Transmission RPM and Gear and provides the output Impeller torque and Output torque.



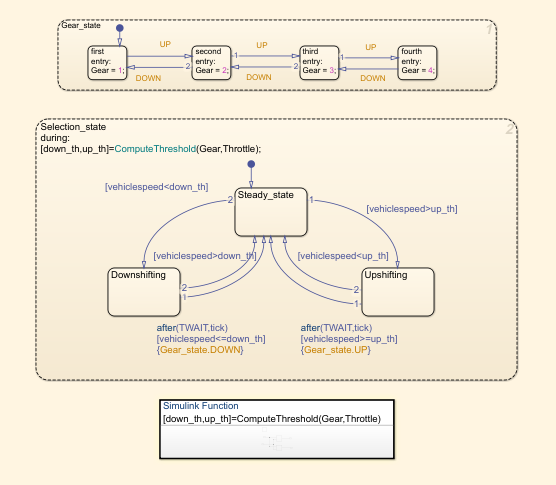
This calculates the transmission gear ratio using the lookup table.

**Vehicle Subsystem**

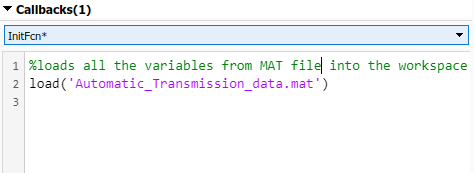


This subsystem takes the input of Output Torque and Brake Torque and provides the output Transmission RPM and vehicle speed.

**Transmission Control Unit (Using Stateflow)**



1. **Callbacks**



I have used Model callback here to load the variables from MAT file into

the workspace.

1. **Data Inspector**
2. **Solver Selection Strategy**
3. **MATLAB function block**
4. **Look-up table**
5. **Signal Builder**