

Project Agenda:

Simulating a Car production factory.

Description of how the production is done:

First, the user enters the number of assembly lines which essentially means the number of different types of cars to be produced. That number of cars are instantiated in a Car array and corresponding to each car the user is prompted to enter the type of custom part the user wishes to install.

The production is started as soon as the user finishes entering the information correctly (All selections in range). Different threads are run for each instance of a car (i.e., the number of assembly lines). Each thread manufactures a single car and starts fitting the parts in the given order:

- 1) Frame
- 2) Wheel
- 3) Engine
- 4) Interior
- 5) Chassis
- 6) Color

As soon as all the parts are fitted in a car, the thread dies and production of that particular car is finished. The main thread waits for all the threads to die and then notifies that production is finished on all assembly lines.

Description of several classes:

1. Car: the instance of this class is a shared memory which is used by the assembly line threads as a means of communication and synchronization. The description of several fields of Car class are given below:

- + assemblyLineNumber : int. This variable is initialized by the user and denoted the number of assembly line threads
- + totalTime : long (initialized to 0) The assembly line thread updates this variable as and when each part is fitted in the assemble line simulation.
- + frame : Object of Frame class. This variable is used by the assembly line threads to access the shared instance of Car in mutually exclusive manner.
- + wheel : Object of Wheel class. This variable is used by the assembly line threads to access the shared instance of Car in mutually exclusive manner.
- + engine : Object of Engine class. This variable is used by the assembly line threads to access the shared instance of Car in mutually exclusive manner.
- + interior : Object of Interior class. This variable is used by the assembly line threads to access the shared instance of Car in mutually exclusive manner.

- + chasis : Object of Chasis class. This variable is used by the assembly line threads to access the shared instance of Car in mutually exclusive manner.
- + color : Object of Color class. This variable is used by the assembly line threads to access the shared instance of Car in mutually exclusive manner.

Description of the methods:

- Car- constructor to initialize assemblyLineNumber
- void select()- method to select which kind of fittings of the different parts are to be done for each car in assembly line
- String displaytime(long)- method to display time taken
- void run()- method to run and fit the different parts of the car in the assembly line according to the selections made.
- void fitFrame()- method to account for the time taken for the fitting of Frame, it displays the time taken for it.
- void fitWheel()- method to account for the time taken for the fitting of Wheel, it displays the time taken for it.
- void fitEngine()- method to account for the time taken for the fitting of Engine, it displays the time taken for it.
- void fitInterior()- method to account for the time taken for the fitting of Interior, it displays the time taken for it.
- void fitChasis()- method to account for the time taken for the fitting of Chasis, it displays the time taken for it.
- void fitColor()- method to account for the time taken for the fitting of Color, it displays the time taken for it.
- void finished- method to account for the time taken for the fitting of all parts, it displays the total time taken.

2. Solution: The fields and the methods of this class are explained below:

- + assemblyLines : int(initialised to 0). Accepts the number of assembly lines in the factory decided by the user.

Description of the methods:

o void main() – It accepts the number of assembly lines required. It instantiates Car thread array and starts the execution of the needed threads. It starts all the threads and waits for all threads to die to stop production and displays the same.

3. Frame: This class makes the selection of frame type as an input from the user when called. It assigns the different time taken for different selections. The fields and the methods of this class are explained below:

- + frameType : int. Accepts the frame type selected by the user.
- + timeTaken : long. Stores the time taken by different frame types.

Description of the methods:

- o Frame- Constructor to initialize frameType with user selection and call the selectFrame() function.
- o void selectFrame()- According to the user input accepted in constructor it calls the required frame type function to set the time taken.
- o void frame1()- Function to set the time taken for the particular selection.
- o void frame2()- Function to set the time taken for the particular selection.
- o void frame3()- Function to set the time taken for the particular selection.
- o void frame4()- Function to set the time taken for the particular selection.
- o void frame5()- Function to set the time taken for the particular selection.

4. Wheel: This class makes the selection of wheel type as an input from the user when called. It assigns the different time taken for different selections. The fields and the methods of this class are explained below:

- + wheelType : int. Accepts the wheel type selected by the user.
- + timeTaken : long. Stores the time taken by different wheel types.

Description of the methods:

- o Wheel- Constructor to initialize wheelType with user selection and call the selectWheel() function.
- o void selectWheel()- According to the user input accepted in constructor it calls the required wheel type function to set the time taken.
- o void wheel1()- Function to set the time taken for the particular selection.
- o void wheel2()- Function to set the time taken for the particular selection.
- o void wheel3()- Function to set the time taken for the particular selection.

5. Engine: This class makes the selection of engine type as an input from the user when called. It assigns the different time taken for different selections. The fields and the methods of this class are explained below:

- + engineType : int. Accepts the engine type selected by the user.
- + timeTaken : long. Stores the time taken by different types.

Description of the methods:

- Engine- Constructor to initialize engineType with user selection and call the selectEngine() function.
- void selectEngine()- According to the user input accepted in constructor calls the required engine type function to set the time taken.
- void engine1()- Function to set the time taken for the particular selection.
- void engine2()- Function to set the time taken for the particular selection.
- void engine3()- Function to set the time taken for the particular selection.
- void engine4()- Function to set the time taken for the particular selection.
- void engine5()- Function to set the time taken for the particular selection.
- void engine6()- Function to set the time taken for the particular selection.
- void engine7()- Function to set the time taken for the particular selection.
- void engine8()- Function to set the time taken for the particular selection.

6. Interior: This class makes the selection of interior type as an input from the user when called. It assigns the different time taken for different selections. The fields and the methods of this class are explained below:

- + interiorType : int. Accepts the interior type selected by the user.
- + timeTaken : long. Stores the time taken by different types.

Description of the methods:

- Interior- Constructor to initialize interiorType with user selection and call the selectInterior() function.
- void selectInterior()- According to the user input accepted in constructor calls the required interior type function to set the time taken.
- void interior1()- Function to set the time taken for the particular selection.
- void interior2()- Function to set the time taken for the particular selection.
- void interior3()- Function to set the time taken for the particular selection.

7. Chasis: This class makes the selection of chasis type as an input from the user when called. It assigns the different time taken for different selections. The fields and the methods of this class are explained below:

- + chasisType : int. Accepts the chasis type selected by the user.
- + timeTaken : long. Stores the time taken by different types.

Description of the methods:

- Chasis- Constructor to initialize chasisType with user selection and call the selectChasis() function.

o void selectChasis()- According to the user input accepted in constructor calls the required chasis type function to set the time taken.

o void chasis1()- Function to set the time taken for the particular selection.

o void chasis2()- Function to set the time taken for the particular selection.

o void chasis3()- Function to set the time taken for the particular selection.

o void chasis4()- Function to set the time taken for the particular selection.

o void chasis5()- Function to set the time taken for the particular selection.

o void chasis6()- Function to set the time taken for the particular selection.

o void chasis7()- Function to set the time taken for the particular selection.

8. Color: This class makes the selection of color type as an input from the user when called. It assigns the different time taken for different selections. The fields and the methods of this class are explained below:

- + colorType : int. Accepts the color type selected by the user.

- + timeTaken : long. Stores the time taken by different types.

Description of the methods:

o Color- Constructor to initialize colorType with user selection and call the selectColor() function.

o void selectColor()- According to the user input accepted in constructor calls the required color type function to set the time taken.

o void color1()- Function to set the time taken for the particular selection.

o void color2()- Function to set the time taken for the particular selection.

o void color3()- Function to set the time taken for the particular selection.

o void color4()- Function to set the time taken for the particular selection.

o void color5()- Function to set the time taken for the particular selection.

o void color6()- Function to set the time taken for the particular selection.

o void color7()- Function to set the time taken for the particular selection.

o void color8()- Function to set the time taken for the particular selection.

o void color9()- Function to set the time taken for the particular selection.

o void color10()- Function to set the time taken for the particular selection.

o void color11()- Function to set the time taken for the particular selection.

o void color12()- Function to set the time taken for the particular selection.