**Mathematical Model:**

Let ‘S’ be the system consisting of a robotic arm to pick and place target objects at desired location.

Where,

S = {Input (I), Functions (F), Output (O), Terminating Conditions (TC), Success(S), Failure (Fa), Exception (E)}

* Input = It defines the input set of the system

Input = {I1, I2, I3}

Where,

I1 = Master images for reference to image processing

I2 = Environmental variables for initialization of robotic arm

I3 = Captured image for image processing

* Output = It defines the output set of the system

Output = {O1, O2}

Where,

O1 = Target object’s dimensions and position is acquired

O2 = Object is placed at target destination

* Functions = It defines the set of functions

Functions = {F1, F2, F3}

Where,

F1 = Storing and retrieving of master images via socket

F1 = {Success1, Success2, Failure1, Failure2}

Success1 = the master images were successfully stored via socket.

Success2 = the master images were successfully retrieved via socket.

Failure1 = socket error while sending images.

Failure2 = socket error while sending images.

F2 = Image Detection

F2 = {Success3, Failure3}

Success3 = the images were properly captured.

Failure3 = blur images were captured.

F3 = Movement of robotic arm (Picking and placing of target object)

F3 = {Success4, Success5, Failure4}

Success4 = proper movement of the arm towards the target position.

Success5 = object picking was done properly.

Failure4 = Failure in movement of robotic arm towards target location.

Failure5 = Failure in picking of object.

* Terminating Conditions = It defines the terminating conditions of the system

Terminating Conditions = {TC1, TC2, TC3}

Where,

TC1 = Master images stored and retrieved

TC2 = Details of target object gained

TC3 = Object picked and placed at destination

* Success = It is the success set of the System.

Where,

Success = {Success1, Success2, Success3, Success4, Success5}

* Failure = It is the failure set of the system

Where,

Failure = {Failure1, Failure2, Failure3, Failure4, Failure5}

* Exception = This set defines the exceptions that can occur in the system

Exception = {E1, E2, E3, E4}

Where,

E1 = Defects in master image

E2 = Unexpected deviations in target object’s details

E3 = Slip of object from robotic arm

E4 = System affected due to environmental conditions

* Venn Diagram:

