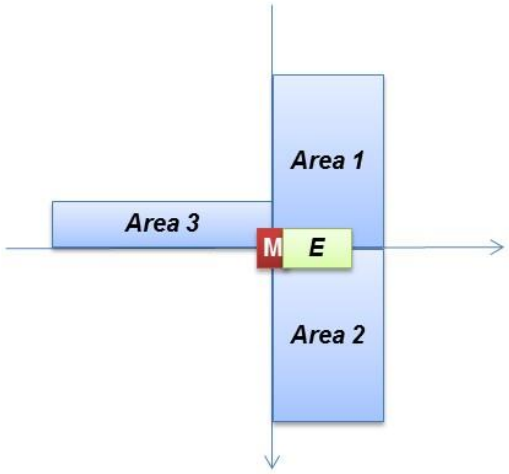
Design of the Narukami_AI for Mario Game

1. *Finite State Machine*
   - a) *GapStatus*
     - i. *Description: a status that when Mario is facing a gap;*
     - ii. *Enter Condition: detecting the level scene in front of the Mario to check if there is a gap;*
     - iii. *Exit Condition: the **JUMP** button is released and Mario is on the ground;*
     - iv. *Strategy: pressing the **JUMP**, **RIGHT**, and **SPEED** buttons all the time until exit this status.*
   - b) *ObstacleStatus*
     - i. *Description: a status that when Mario is standing in front of / two steps away from the obstacle, which could be a wall, a flower pot, or a cannon;*
     - ii. *Enter Condition: if Mario is standing in front of the obstacle, of two steps away (this'll be generated randomly with a possibility of 1/3);*
     - iii. *Exit Condition: the **JUMP** button is released and Mario is on the ground again;*
     - iv. *Strategy: if an enemy is detected, the **SPEED** button will be hit repeatedly to shoot the fire, hold **JUMP** button trying to get over the obstacle, and hold the **LEFT** button to stop the Mario and start shooting fire.*
   - c) *EnemyInsightStatus*
     - i. *Description: a status that an enemy near Mario is detected, in the range of **{ 7(Positive X), 0(Negative X), 4(Positive Y), 4(Negative Y) }**;*
     - ii. *Enter Condition: if an enemy is detected within the testing area;*
     - iii. *Exit Condition: if there's no enemy in the testing area, or when Mario is facing the obstacle or gap;*
     - iv. *Strategy: the Mario will act according to this paragraph:*

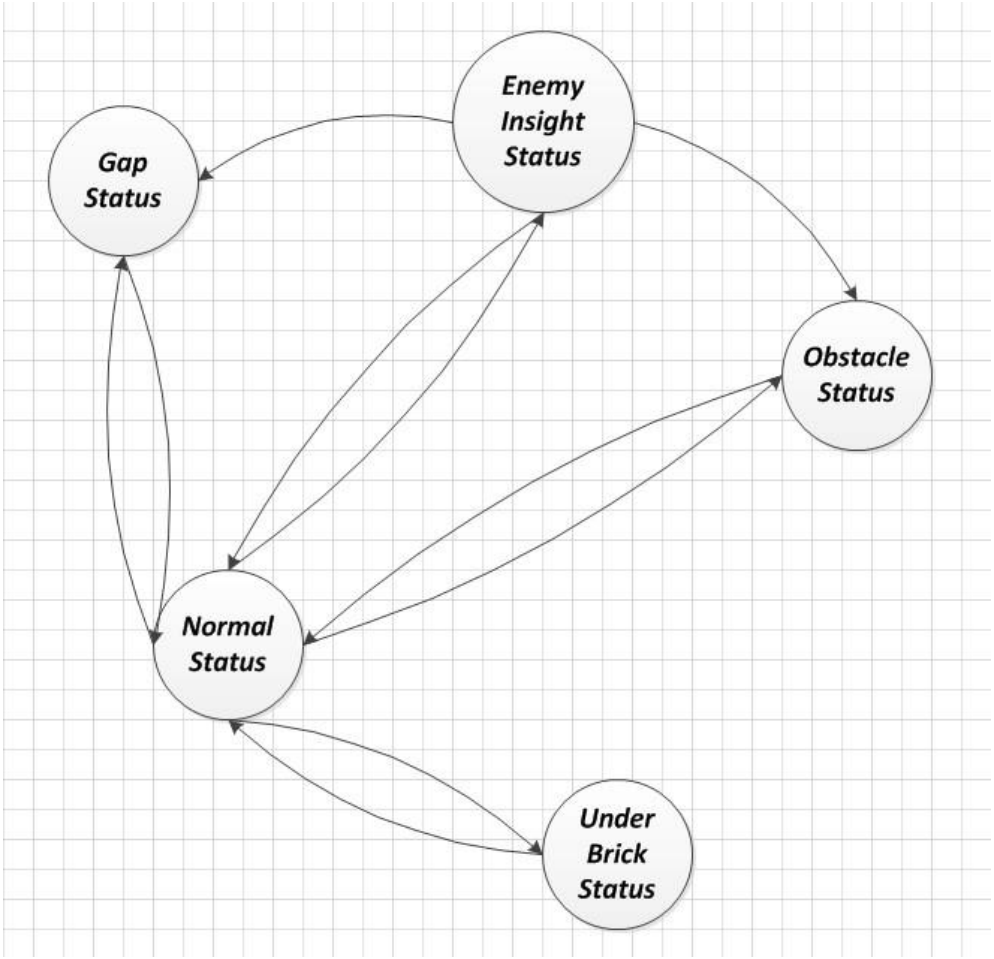


- *E (Emergency): just hit the **SPEED** button repeatedly, and if Mario can shoot fire, it'll do it randomly in a possibility of 1/3;*
- *Area 1: hit the **JUMP** button in a delay of 3, and hit the **SPEED** button repeatedly to shoot the fire;*
- *Area 2: only hit the **SPEED** button repeatedly to shoot the fire;*
- *Area 3: oops, enemy behind me, hold the **SPEED** button to speed up running away.*

   - d) *UnderBrickStatus*
     - i. *Description: a status when Mario is standing under a soft obstacle or a brick with X offset of 1;*
     - ii. *Enter Condition: when Mario is standing under a soft obstacle or a brick randomly with a possibility of 1/3;*
     - iii. *Exit Condition: the **JUMP** button is released and Mario is on the ground again;*
     - iv. *Strategy: press the **JUMP** button for a period of time;*
   - e) *NormalStatus*
     - i. *Description: normal status, the default one;*
     - ii. *Strategy: the **SPEED** button is hold in a random period of time from 10 to 20, and if Mario is standing on an edge and there's a gap up ahead, release the **SPEED** button and hold **LEFT** button to slow down.*

*NOTE: the **RIGHT** button is hold in ALL the status*

2. *Finite State Diagram*



3. *Important Tool: TimingButton*
   a) *Description: TimingButton simulates two ways that people hit the button:*
      i. *Holding for a period of time*
      ii. *Hitting the button repeatedly*
   b) *Illustration of the buttons*

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eStandard: |--Delay-->|-----On----->|---------Off------------>
eRepeated: |--Delay-->|-----On----->|---Intermittent--->|
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   c) *Operations:*
      i. *Initialize*
      ii. *StartImmediately*
      iii. *Start*
      iv. *Update*
      v. *Release*