# User Behavior Simulation – Python

TaskCompletionManager

List of Tasks:

* 0 = Create Summary File
* 1 = Open Summary File
* 2 = Open File Q1
* 3 = Open File Q2
* 4 = Open Calculator
* 5 = Do math using Calculator
* 6 = Edit and Save Summary

Rules:

* 1 only if 0
* 6 only if 1 and 5
* 5 only if 2,3 and 4

Repetitions apply only to

* 1
* 2
* 3
* 4

Task Selection Modeling:

* Exponential distribution (with high lambda, it is very likely that user will do the job in the listed sequence; low lambda allows for permutation
* Maximum number of repetitions can be limited
* Probability between 0 and 1 can be set if repetition occurs or not

ApplicationInstanceManagement

Manages the hierarchy of visible applications and application states

States:

* 0 = Closed
* 1 = Foreground
* 2 = Background
* 3 = Minimized

Application Arrays

* Explorer States
* Explorer Paths
* Notepad States
* Notepad Files
* Calculator States

Limitation of max opened applications at a time to give simulated user the opportunity to open multiple istances and files at a time:

* MaxInstanceExplorer
* MaxInstanceCalculator
* MaxInstanceNotepad

Assigned by drawing from exponential distribution

Machine Reactivity:

* Normal distribution with mean 0.4s and stddev 0.1s

KeyboardSimulation

* NUM keys are 0,1,2,3,4,5,6,7,8,9,+,-,\*,/
* Control keys start and end with # (for shift, F-keys, ...)
* All others are normal TEXT
* Typing delay is modeled as a normal distribution with mean (0.4 + (reactivity\*0.5)) with stddev 0.1  
  Max mean: 0.9s  
  Min mean: 0.4s
* draw from uniform distribution a random number and compare to threshold *keyprecision* resulting in extra keys

MouseMovementSimulation

Screen is separated in 4x4 zones

* MouseMoveDelay per Zone is normal with mean (0.3 + reactivity) and stddev 0.08
* Single Click Delay is normal with mean (0.15 + reactivity\*0.2) and stddev 0.03
* Double click delay is normal with mean (0.05 + reactivity\*0.1) and stddev 0.01
* Draw random number from uniform distribution to check against *mouseprecision* threshold. If bigger, then mouse moves with 50% chance to wrong direction or 50% stays when it should move.

UserInteractionSimulation

Control Variables are

* ARRAY\_SIZE (Buffer Management)
* Runs (number of total runs using a specific setting)
* MaxInstanceExplorer
* MaxInstanceCalculator
* MaxInstanceNotepad
* Global\_mouseprecision (the higher the more precise)
* Global\_hotkeyusage (1 = always hotkeys)
* Global\_appclosing (1 = always closing)
* Global\_minimize (1 = user tends to minimize application instead of leaving in in the Foreground)
* Global\_keyprecision (the higher the more precise)
* Global\_openOrreopen (chance of Opening over Reopening)
* Global\_reactivity (0 = fast user while 1 = slow user)
* Global\_repetition (0 = no task repetitions, 1 = max probability of repeating tasks)
* Global\_sequential (lambda parameter of exponential function for task selection)
* Global\_search (the higher, the more often using the search function

Each of the following tasks are modeled based on the above described control variables. Random numbers are drawn from uniform distributions to decide.

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Example Output Log

767,M,[3,1],1

1548,M,[2,1],1

2241,M,[1,1],1

2507,K3,[1,1,1],1

3139,K1,[TEXT],1

3779,K1,[TEXT],1

4579,K1,[TEXT],1

5161,K1,[TEXT],1

5919,M,[1,2],1

6178,K3,[1,1,2],1

6560,A1,[100,explorer.exe,MAIN,4,4,1,4],1

6560,A5,[100,explorer.exe,MAIN],1

6560,A7,[100#explorer.exe],1

6560,A8,[100,,MAIN],1

7412,M,[2,2],1

7645,K3,[1,2,2],1

8302,K1,[28],1

8302,A8,[100,MAIN,documents/],1

8539,K3,[1,2,2],1

9074,K1,[28],1

9074,A8,[100,documents/,documents/summary],1

9815,M,[3,2],1

10606,M,[3,3],1

10852,K3,[2,3,3],1

11788,M,[3,2],1

12010,K3,[1,3,2],1

12256,K3,[1,3,2],1

12548,K3,[1,3,2],1

12771,K3,[1,3,2],1

13619,K1,[14],1

14165,K1,[TEXT],1

14944,K1,[TEXT],1

15535,K1,[TEXT],1

16063,K1,[TEXT],1

16717,K1,[TEXT],1

17243,K1,[TEXT],1

18012,K1,[TEXT],1

18586,K1,[TEXT],1

19282,K1,[TEXT],1

19966,K1,[TEXT],1

20719,K1,[TEXT],1

21342,K1,[TEXT],1

22083,K1,[28],1

22914,M,[4,2],1

23716,M,[4,3],1

24392,M,[4,4],1

24656,K3,[1,4,4],1

25133,A4,[100,explorer.exe],1

25133,A6,[100,explorer.exe,4,4,-1,-1],1

25133,A7,[100#explorer.exe],1

Notepad ReadTime

readTime = np.random.normal(3.0 + (global\_reactivity \* 10), 0.7)