



دانشگاه تهران
دانشکده روانشناسی و علوم تربیتی



MATLAB for Brain and Cognitive Psychology (Timing)

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Priority

- Modern computers have multiple software processes constantly competing for access to resources.
- How these resources are allocated moment to moment can affect the execution of your script



Priority

- Use `Priority()` to set the priority level
- The higher the priority level, the less chance there is of other processes interfering with your script
- Available levels and their functions differ depending on your OS
- Recommendation: When you are testing with PTB, close applications other than Matlab
- Use PTB's `Priority` function to assign a priority to the execution of your process



Priority

```
whichScreen = max(Screen('Screens'));  
maxPriorityLevel = MaxPriority(whichScreen);  
Priority(maxPriorityLevel);
```

These lines would go at
the beginning of your
script to set priority
level for that script



Control timing of task

Measures for time :

- Tic toc
- GetSecs()
- WaitSecs()



Some example for flow control

- WaitSecs()
- vbl = Screen('Flip', wPtr,time)
- State based flowchart



Programing flowchart

Random selection image from list
randperm (7,1,1)

Show Fixation for 1 sec

Show Image for 1 sec

Clean Image on screen

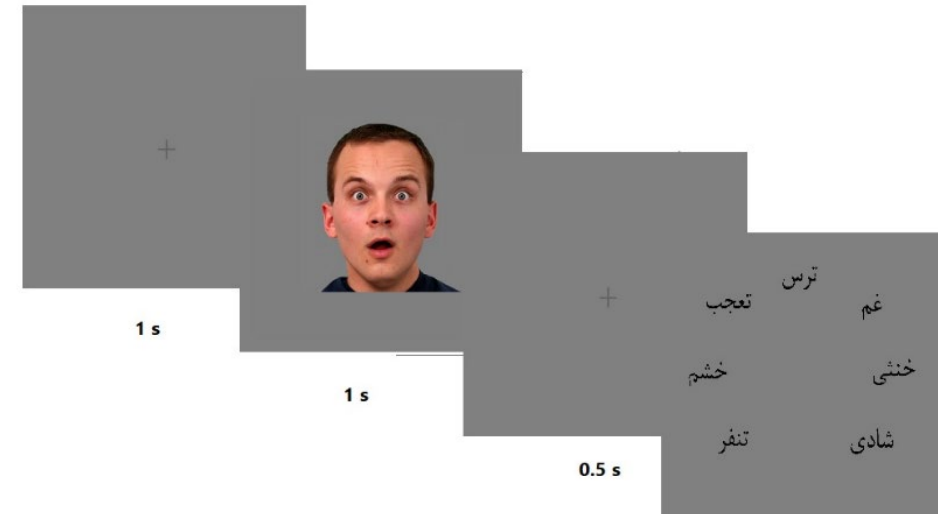
Show Fixation for 0.5 sec

Show response options

Getclick on the screen

Check if the subject Choose Correct choice

End of trial



Programing flowchart (WaitSecs)

Random selection image from list
randperm (7,1,1)

Show Fixation for 1 sec WaitSecs(1)

Show Image for 1 sec WaitSecs(1)

Clean Image on screen

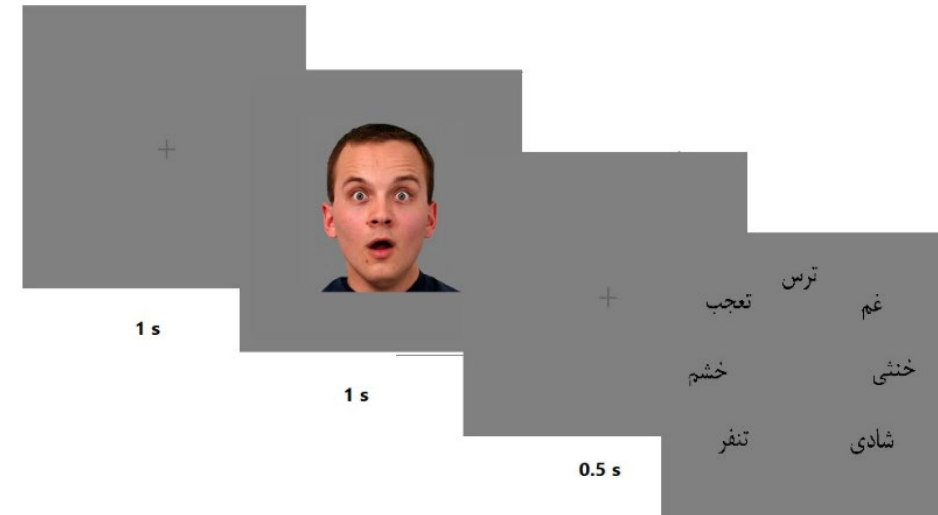
Show Fixation for 0.5 sec WaitSecs(1)

Show response options

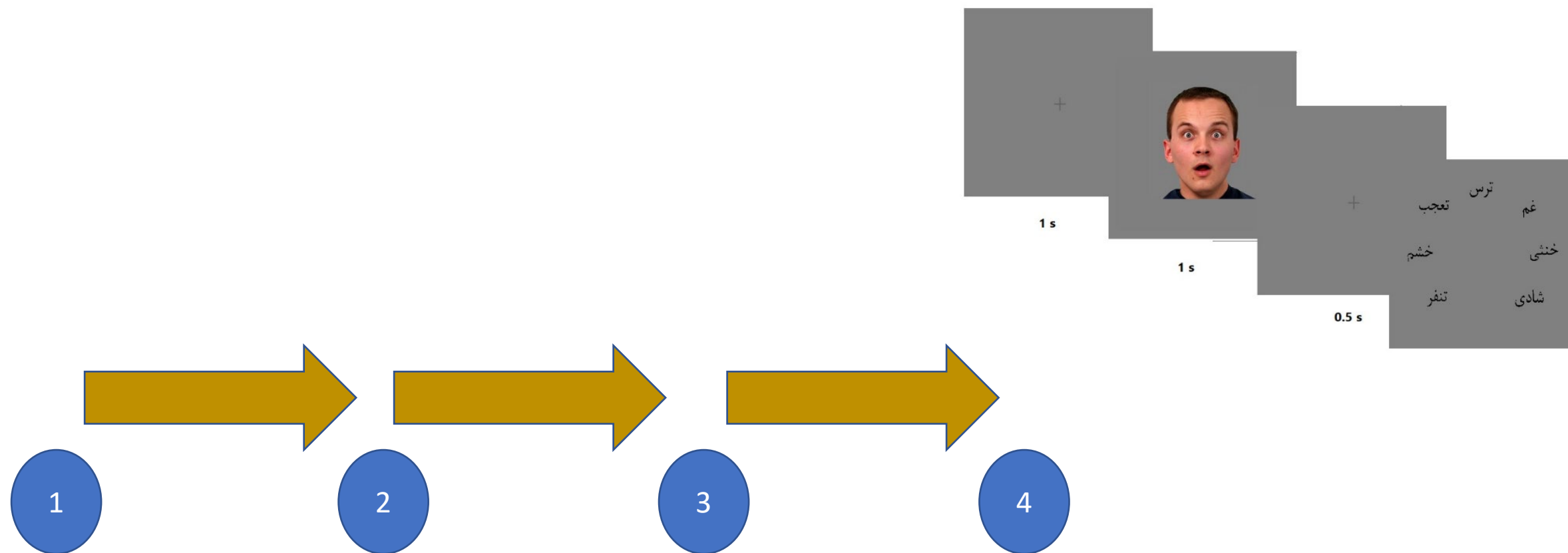
Getclick on the screen

Check if the subject Choose Correct choice

End of trial

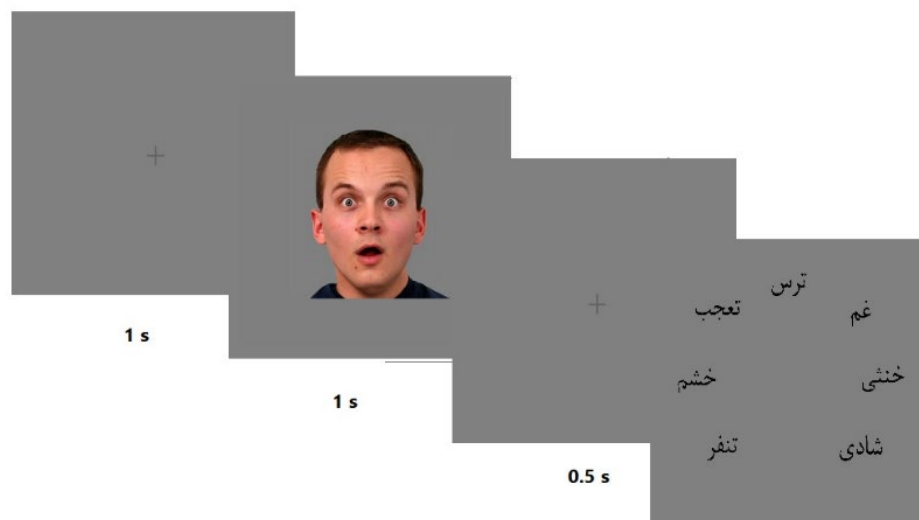


Programing flowchart (State based)

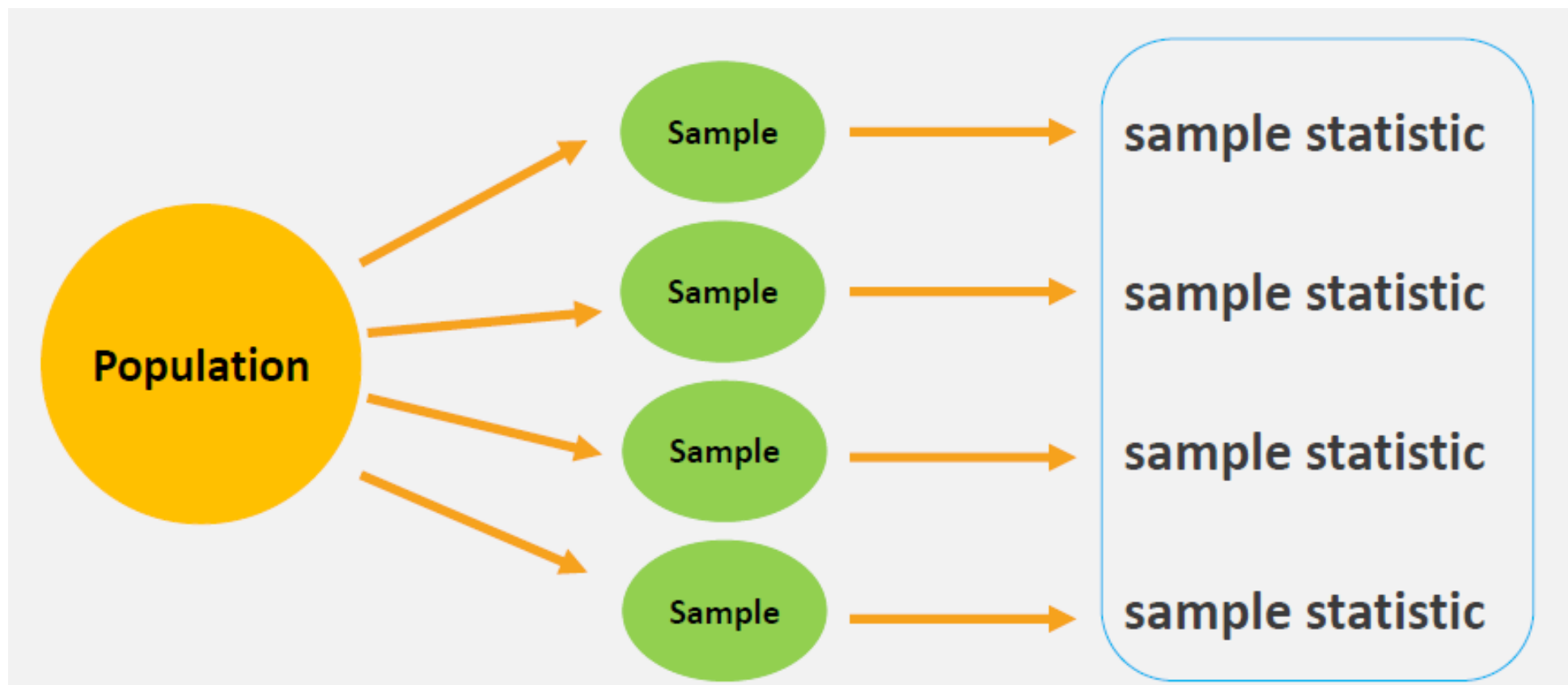


Experiment terminology

- Subject
- Sessions
- Conditions
- Trial
- Performance
- Reaction time
- Accuracy



Trial repetition



Randomization

- On startup, Matlab initializes the random number generator.
- The rng creates a sequence of random numbers called the *global stream*.
- The random number functions (**rand**, **randi**, **randn**) access this list of numbers, in order



Randomization

- `rng` controls the random number generator

```
>> rng

ans =

    Type: 'twister'
    Seed: 0
    State: [625x1 uint32]

>> rng default
>> randi(100,[1,10])

ans =

    82    91    13    92    64    10    28    55    96    97

>> rng default
>> randi(100,[1,10])

ans =

    82    91    13    92    64    10    28    55    96    97
```



Randomization

- "Seed" the random number generator to generate different values
- Common seed to use is the current time
- `rng shuffle` to reseed with current time



Randomization

```
>> rng shuffle
>> rng

ans =

    Type: 'twister'
    Seed: 2062320423
    State: [625x1 uint32]

>> rng(1)
>> rng

ans =

    Type: 'twister'
    Seed: 1
    State: [625x1 uint32]

>> rng(5,'combRecursive')
>> rng

ans =

    Type: 'combRecursive'
    Seed: 5
    State: [12x1 uint32]
```



Permutation

- Matlab function `randperm()` and PTB function `Shuffle()` are useful for permuting lists



Permutation

- `randperm(N)` will create a vector of numbers from 1 to N in random order.
- You can use these numbers as indexes to reference multiple lists in the same random order



Permutation

- Example:
 - You have a list of fruits, and a separate list of colors that describe those fruits. They are in order, such that $\text{colors}\{1\}$ describes the color of $\text{fruits}\{1\}$.
 - You want to describe the name and color of each fruit, but in random order



Permutation

- PTB function `Shuffle()` will take a vector or matrix, and return to you the items in random order
- If the input has multiple rows, each column will be shuffled, but numbers will stay in their columns. Note this multi-column shuffle does not work with cell matrices.



Other randomization functions

- RandSample()
- ChooseKFromN()
- RandSel()
- URandSel()
- CoinFlip()



Assignment #10

- Create a function called `yourinitials_session10()`
 - Using the some emotional faces (happy and neural) make a task for emotion recognition. You can 5 level of noise to image (0, 20 40 60 ,100)% noise. Task started by one second fixation 300 millisecond stimulus presentation and one second delay period, after delay subject should respond with keyboard that emotion is happy or not.
 - Calculated the number of trials are needed for this experiment.

