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%%-------------------------------------------------------------------------
%%Project-1:: Question - 3
%%To Simulate a fair coin toss 100 times and generating a histogram showing
%%the heads run lengths

%%The below function performs the following
%%1) Rand function(Uniformly distributed random numbers) to generate a
   %%random number between (0,1) as per user defined num_of_flips
%%2) find function to get the indices of above vector having '0'(Heads) and
   %%dump it in an array
%%3) Add an elements with 1 to above array to check if the result equals
   %%the next elemtent(consecutive heads) and build Heads distribution
%%4) Now that we have an array of consecutive heads distribution, plot
   %%histogram for those elements and get the Max of that array.
%%-------------------------------------------------------------------------
function [ ] = coin_toss(num_of_flips)
  % generate a vector of num_of_flips Flips
  coin_flips = rand(num_of_flips, 1) > 0.5;
  % get the indices of heads(0) from the overall coin_flips array
  Indices_of_heads = find(coin_flips==0);
  [len_of_indices_vector,~] = size(Indices_of_heads);
  consecutive_heads=1;
  disp(coin_flips)
  disp('Indices of matrix which has heads')
  disp(Indices_of_heads)

  head_run_lengths = zeros(1, num_of_flips);
  %For loop to get the number of instances of consecutive heads
  for iter=1:(len_of_indices_vector-1)
      if iter == (len_of_indices_vector-1)
          head_run_lengths(iter+1) = consecutive_heads;
      end
      if (Indices_of_heads(iter) + 1) ~= Indices_of_heads(iter+1)
          head_run_lengths(iter) = consecutive_heads;
          consecutive_heads=1;
      else
          consecutive_heads = consecutive_heads+1;
      end
  end
  %removes the '0's in the array containing distribution of heads
  head_run_lengths = head_run_lengths(head_run_lengths~=0);

  disp('Distribution of consecutive heads')
  disp(head_run_lengths)
  %Gets the longest instance of consecutive heads
  Max_heads_run_length = max(head_run_lengths);
  disp('Longest consecutive run of heads')
  disp(Max_heads_run_length)
  histogram(head_run_lengths);
```