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% char2psk.m
% Function to encode a string of ASCII text into M-PSK symbols.
%
% The encoded string may be padded with a period and/or spaces
% to arrive at an integer number of M-ary symbols.
%
% ECE501, Au2008
% lcp
%
% str    string variable with text
% M      size of PSK constellation (2,4,8,16,32 or 64)
% a      output list of PSK symbols (complex-valued)

function a = char2psk(str,M);         % call as Matlab function
%error checks
if(nargin ~= 2)
    error('Error: the function char2psk requires two input arguments')
end
if (ischar(str) ~= 1 | isempty(str))
    error('Error: the input STR must be a string variable.')
end
tmp = [2 4 8 16 32 64] - M;tmp = length(find(tmp==0));
if (tmp ~= 1)
    error('Error: M must be 2, 4, 8, 16, 32, or 64.')
end

%pad string to multiple of length 15
%using 8 bits per character, results in common multiple of 2,3,4,5,6
N = length(str);
tmp = mod(8*N,log2(M));
if (tmp ~= 0)
    Nbits = lcm(8,log2(M))*[1 : N];
    Nbits = min(Nbits(find((Nbits > 8*N))));
    %Nbits = min(Nbits(find((Nbits > 8*N) & ...
        %(mod(Nbits,log2(M)==0)) )));
    for k = N+1 : Nbits/8-1,
        str = [str ' '];
    end
    str = [str '.'];
    N = length(str);%new length
end

% string to decimal
str_decimal = double(str);
% decimal to binary
str_binary = dec2bin(str_decimal,8);
% convert array row-by-row to one long string
str_binary = reshape(str_binary',1,8*N);
% binary to symbols
```

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for k=1 : 8*N/log2(M);
    count = bin2dec(str_binary([1:log2(M)]+(k-1)*log2(M)));
    a(k) = exp(j*2*pi*count/M);
end
a = a*exp(j*2*pi/(2*M));%offset from axis
% end of function
```