```matlab
% Author: Group 2 (Hang Xu, Wen Wu,
Wenjun Ma)
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% Filename: Matlab script for EE2A
Experiment5 Wire-Following Sensor and
Associated Signal Processing
% Program function: Receive data from
PIC and implement the signal
processing algorithm.

clear;

ADC_Sampling_Rate = 32e3;%
PIC18F27K40 was programmed to collect
data at a 32 kHz rate
ADC_Sampling_Points = 128;%
PIC18F27K40 was programmed to collect
128 samples of data

% Configure port
COM_Port = 'COM3';
COM_Baud = 9600;
% Create serial port object
RS232_Object =
serial(COM_Port,'BaudRate',COM_Baud,'
DataBits',8,'Parity','none','StopBits
',1,'FlowControl','none','InputBuffer
Size',1024,'OutputBufferSize',1024,'T
erminator',char(93));
fopen(RS232_Object);
% Send commands using fwrite
Command = ['collect data' char(13)];%
Send 'ADC' command string
fwrite(RS232_Object,Command,'int8');
% Recover the data collected by the
ADC
ReturnedString =
fscanf(RS232_Object);
fclose(RS232_Object);
ReturnedTableString =
ReturnedString(20:end);
ReturnedTable =
str2num(ReturnedTableString);
% Display the data in the time domain
t = (0:ADC_Sampling_Points-
1)/ADC_Sampling_Rate;
plot(t,ReturnedTable)
title('Sensed Signal')
xlabel('t (milliseconds)')
ylabel('Sensed Signal(t)')

X = ReturnedTable;
% generate four look up table for
local oscillators

Local1_real=round(64*cos(2*pi*1000*t)
);
Local1_imag=round(-
64*sin(2*pi*1000*t));
Local2_real=round(64*cos(2*pi*2000*t)
);
Local2_imag=round(-
64*sin(2*pi*2000*t));
% multiplier
Multi_1coscos=Local1_real.*X;
Multi_1cossin=Local1_imag.*X;
Multi_2coscos=Local2_real.*X;
Multi_2cossin=Local2_imag.*X;
% moving average filter
Filter_Multi_1coscos=0;%initialize
Filter_Multi_1cossin=0;
Filter_Multi_2coscos=0;
Filter_Multi_2cossin=0;
  %sample every 32 cycle
for a=1:1:96
    Filter_Multi_1coscos(a)=
(sum(Multi_1coscos(a:a+31)));
    Filter_Multi_1cossin(a)=
(sum(Multi_1cossin(a:a+31)));
    Filter_Multi_2coscos(a)=
(sum(Multi_2coscos(a:a+31)));
    Filter_Multi_2cossin(a)=
(sum(Multi_2cossin(a:a+31)));
end
  % accumulation
cos_1k =
sum(Filter_Multi_1coscos(1:96))/96/65
536/2;
sin_1k =
sum(Filter_Multi_1cossin(1:96))/96/65
536/2;
cos_2k =
sum(Filter_Multi_2coscos(1:96))/96/65
536/2;
sin_2k =
sum(Filter_Multi_2cossin(1:96))/96/65
536/2;
```