Heaven's Light is Our Guide

Rajshahi University of Engineering& Technology

Department of Electrical & Computer Engineering

Course No: ECE 4123
Course Name: Digital Signal Processing

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Experiment Name: Study and implementation of correlation on a continuous signal with its delayed signal and finding out the time where 2 signals produces highest amplitude.

Theory: In this experiment, we have done correlation of a continuous signal to its delayed signal which lies mainly in the field of auto correlation. Autocorrelation is the correlation of a time series and its lagged version over time. Although similar to correlation, autocorrelation uses the same time series twice. Financial analysts and traders use autocorrelation to examine historical price movements and predict future ones.

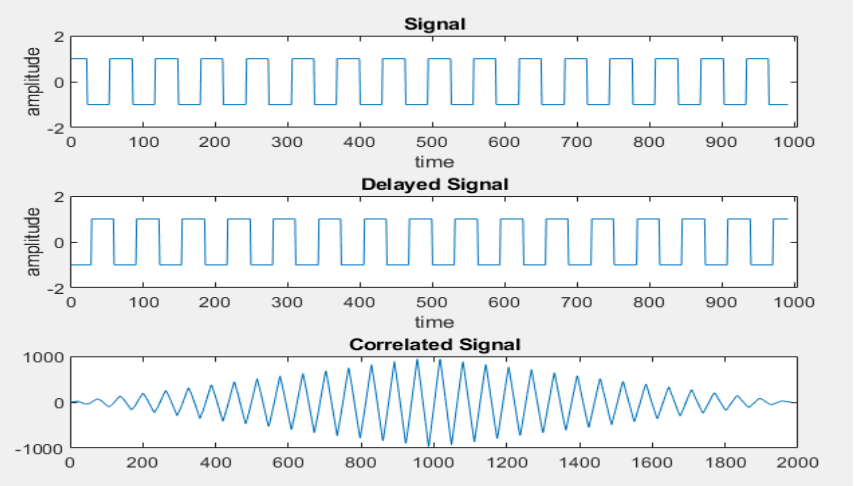
Required software: MATLAB

Code:

```
clc;
clear all;
close all;
t= 1:0.1:100;
x= square(t);
y= square(t-10);
subplot(3,1,1)
plot(x);
xlabel('time');
ylabel('amplitude');
title('Signal');
axis([-1 1005 -2 2]);
subplot(3,1,2)
plot(y);
xlabel('time');
ylabel('amplitude');
title('Delayed Signal');
axis([-1 1005 -2 2]);

z=xcorr(x,y);
t1 = length(x)+1 : length(x)-1;
subplot(3,1,3)
plot(z)
title('Correlated Signal');
[max_value, max_index] = max(abs(z))
time_delay = (max_index - 1)/10
```

Figure:



Output:

```
max_index =

   985
```

```
time_delay =

   98.4000
```

Conclusion:

The experiment was done successfully as we have achieved the expected output which matches theoretical analysis.