**Aim: To implement basic function of Code Division Multiple Access (CDMA) to test orthogonality and auto correction of a code to be used for CDMA operation.**

**Theory:**

CDMA Overview

Code Division Multiple Access system is very different from time and frequency multiplexing. In this system, a user has access to the whole bandwidth for the entire duration. The basic principle is that different CDMA codes are used to distinguish among the different users.

Techniques generally used are direct sequence spread spectrum modulation (DS-CDMA), frequency hopping or mixed CDMA detection (JDCDMA). Here, a signal is generated which extends over a wide bandwidth. A code called spreading code is used to perform this action. Using a group of codes, which are orthogonal to each other, it is possible to select a signal with a given code in the presence of many other signals with different orthogonal codes.

How Does CDMA Work?

CDMA allows up to 61 concurrent users in a 1.2288 MHz channel by processing each voice packet with two PN codes. There are 64 Walsh codes available to differentiate between calls and theoretical limits. Operational limits and quality issues will reduce the maximum number of calls somewhat lower than this value.

In fact, many different "signals" baseband with different spreading codes can be modulated on the same carrier to allow many different users to be supported. Using different orthogonal codes, interference between the signals is minimal. Conversely, when signals are received from several mobile stations, the base station is capable of isolating each as they have different orthogonal spreading codes.

Advantages of CDMA

CDMA has a soft capacity. Greater the number of codes, more the number of users. It has the following advantages −

* CDMA requires a tight power control, as it suffers from near-far effect. In other words, a user near the base station transmitting with the same power will drown the signal latter. All signals must have more or less equal power at the receiver
* Rake receivers can be used to improve signal reception. Delayed versions of time (a chip or later) of the signal (multipath signals) can be collected and used to make decisions at the bit level.
* Flexible transfer may be used. Mobile base stations can switch without changing operator. Two base stations receive mobile signal and the mobile receives signals from the two base stations.
* Transmission Burst − reduces interference.

Disadvantages of CDMA

The disadvantages of using CDMA are as follows −

* The code length must be carefully selected. A large code length can induce delay or may cause interference.
* Time synchronization is required.
* Gradual transfer increases the use of radio resources and may reduce capacity.
* As the sum of the power received and transmitted from a base station needs constant tight power control. This can result in several handovers.

**CODE:**

import numpy as np

c1=np.array([1,1,1,1])

c2=np.array([1,-1,1,-1])

c3=np.array([1,1,-1,-1])

c4=np.array([1,-1,-1,1])

d=list(map(int,input().split(",")))

#d1=-1

#d2=-1

#d3=0

#d4=1

res=c1\*d[0]+c2\*d[1]+c3\*d[2]+c4\*d[3]

print(res)

a=int(input("Enter station to listen from : "))

print()

if(a==1):

res1=np.dot(res,c1)

elif(a==2):

res1=np.dot(res,c2)

elif(a==3):

res1=np.dot(res,c3)

elif(a==4):

res1=np.dot(res,c4)

print("Data received : ",res1/4)

INPUT: -1,-1,0,1

**OUTPUT:**

[-1 -1 -3 1]

Enter station to listen from : 2

Data received : -1.0

**CONCLUSION:**

Thus we implemented the basic CDMA (Code Division Multiple Access) system and found the output of the function for the respective channel.