CEC300 Project #1 DME Simulation. Fall 2019. CEC300 EE307.

This project is intended to simulate the analysis of DME pulses. The pulses are measured relative to an unsynchronized clock. The program will take in 4 numbers representing the time (in μs) of the pulses. The first two pulses are the transmitted pulses, and the other two pulses correspond to the response as received by the airplane.

Example: consider the following pulse timings.

1862 1874 2024 2036

The spacing for the transmitted pulse is 1874-1860 = 12 μs.

The spacing between the received pulses is 2036-2024 = 12 μs.

This is a valid channel X transmission.

The time between the first transmitted and the first received pulses is 2024-1862 = 162 μs.

This can be converted to distance by (162 – 50)/12.36 = 9.06 nmi.

Task: Create a MATLAB function that takes in the time of 4 pulses. Use only channel X and Y.

- If correct pulses for channel X are detected the system will print

Channel is X; distance is dd.d nautical miles. Where dd.d is the correct distance such as 12.2.

- If correct pulses for channel Y are detected the system will print

Channel is Y; distance is dd.d nautical miles. Where dd.d is the correct distance such as 12.2.

- If the system receives a valid pulse spacing for the X channel when transmitting on the Y channel or vice versa, this means that we have received pulses from an aircraft other than our own. In this case, the system will print. **FRUIT detected.**
- If the measured time between the transmitted and received pulses exceeds 200 nmi than the system will print **Channel is X, no reply** or **Channel is Y, no reply.** depending on the channel.
- If incorrect pulses spacings (receive or transmit) for channel X or Y are detected or if the received signals arrive in less than the built-in delay of the ground station print **Signal Garbled.**

Note: To allow proper grading, the function shall be implemented so the arguments look like the example below, and the result shall be displayed in the following command line. You shall be able to copy and paste the function evaluation in the example and run it. Please submit the "*.m" file in Canvas. Use of MATLAB is required. If you need help please contact the TA (Hanson Yu, YUS5@my.erau.edu) , the instructor, or the other MATLAB resources in campus.

Grading:

System identifies channel X and channel Y pulses correctly	2 points
System calculates the correct distance.	2 points
System correctly identifies FRUIT.	2 points
System correctly identifies garbled signals	2 points
System correctly handles no reply condition	2 points
Total	10 points

Example:

```
>> DME(572,584,772,784)
Channel is X, distance is 12.14 nm.
```

You can test your code with a wide range of test cases. Some sample test cases are below. There is no order in these test cases, nor they cover all the scenarios previously described.

```
DME(572,584,772,784)
DME(1011,1047,1361,1391)
DME(1671,1683,2081,2117)
DME(2307,2319,2337,2349)
DME(5181,5217,7767,7797)
DME(8011,8047, 8300,8322)
```