In [12]:

```
"""
 ================================================================
 |      Author  of      the     Project -       Engineer        Nicola  Lombardi        |
 ================================================================
 |      MSc.    in      Telecommunications      and     Internet        of      Things  |
 |      Telecommunications Engineering          |       SW HW   ENGINEER        |

 |Professional  Profile
 |              it.linkedin.com/in/nicola-lombardi-09046b205


Example to demonstrate: Data Cleaning:
 ======> Remove noise and correct inconsistencies in the data.
          https://www.researchgate.net/publication/382851188_A_whole_method_to_do_Data_Analysis

# https://www.geeksforgeeks.org/deque-in-python/


# Dimostrato che median_filter.py   is an invariant for length


Input DataFrame:
       timestamp            tag_id  angle  tag_height
0  1733062840000  4baf351178aa9b0e    -30         1.2
1  1733062840100  4baf351178aa9b0e    -28         1.2
2  1733062840200  4baf351178aa9b0e    -39         1.2
3  1733062840300  4baf351178aa9b0e    -27         1.2
4  1733062840400  4baf351178aa9b0e     -4         1.2  Anomalous Sample ... ==> Data Cleaning

                            ####################################

                                    Test    Number  1       Preview
                                ####################################


Filtered DataFrame:
       timestamp            tag_id  angle  tag_height
0  1733062840000  4baf351178aa9b0e  -30.0         1.2
1  1733062840100  4baf351178aa9b0e  -29.0         1.2
2  1733062840200  4baf351178aa9b0e  -30.0         1.2
3  1733062840300  4baf351178aa9b0e  -29.0         1.2
4  1733062840400  4baf351178aa9b0e  -28.0         1.2

"""

import sys
import time
from constant import *
import pandas as pd
import statistics
from collections import defaultdict, deque
import datetime
from utils_subroutines import *

clock_string = f"[{datetime.datetime.now()}]"


#       ============================================================
#          ------------ DataFrame       test    ----------------
#       ============================================================

def my_test():
    """
    :documentation:

    My test to completely understand the median_filter logic and the difference in terms of samples
    between input and output


    :block diagram:
                                 ____________________________________
    input.csv ----> |   median _ filter . py              | ------> Output.csv
                    ____________________________________


    :return: NONE
    """
    df = pd.read_csv("input.csv", header=None,
                     names=["timestamp", "tag_id", "angle", "tag_height"]) # Features Naming
    print(f"{clock_string}Input DataFrame PREVIEWER :")
    print(df.head(len(df)))
    count = 0
    print(header.format(count + 1))

    # filter call (median_filter.py)
    filtered_df = median_filter_df_version(df)
    print(f"\n{clock_string}Filtered DataFrame:")
```

```
    print(filtered_df.head(len(filtered_df)))
    print(f"{sep}\n {clock_string} Check of the Length:\n Input csv DF: {len(df)}\n Output csv DF: {len(filtered_

    # Save output.csv from DataFrame
    filtered_df.to_csv("output.csv", index=False, header=False)


def median_filter_df_version(df, time_window=1000):
    """

    :param df: dataframe in which apply Data Cleaning phase
    :param time_window: time window size of the tolerance in seconds [s]
    :return: new filtered dataframe with same size in terms of cols and rows

    :DOCUMENTATION: defaultdict

    1. defaultdict – why use it
    The defaultdict is a subclass of dict that allows you to avoid errors when accessing keys that are not yet pr
    automatically creates a default value. It is especially useful when you need to accumulate values in lists or

    from collections import defaultdict

    d = defaultdict(list)
    d['a'].append(1)
    d['a'].append(2)
    d['b'].append(3)
    print(d)
    # Output: defaultdict(<class 'list'>, {'a': [1, 2], 'b': [3]})

    :DOCUMENTATION: deque

    from collections import defaultdict, deque
    from datetime import datetime, timedelta

    window = timedelta(seconds=60)
    tag_queue = defaultdict(deque)

    for row in dataframe.itertuples():
        tag = row.tag  # ad esempio
        timestamp = row.timestamp

        queue = tag_queue[tag]

        # Elimina tutti i vecchi timestamp fuori dalla finestra
        while queue and (timestamp - queue[0] > window):
            queue.popleft()

        queue.append(timestamp)

        # Ora queue contiene solo i timestamp "validi" entro la finestra per quel tag
        if len(queue) > 1:
            print(f"{len(queue)} eventi recenti per il tag {tag}")


    Median_filter algorithm:

    tag_queue is a dictionary that maps each tag to a deque of timestamps.

    For each row in the DataFrame, you update the queue corresponding to the tag.

    Remove timestamps that are too old (outside the tolerance window).

    After cleanup, you can see how many recent events are still valid for that tag.

    """
    data_store = defaultdict(deque)
    filtered_data = []
    print(f"SETUP: \n\t data_store status -> {data_store} \n\t data_filter status -> {filtered_data}\n\n\n")

    print("[Data Processing]: starting the Bluethoot Beacon Acquisition...")
    test_number = 1
    for index, row in df.iterrows():
        print("-----------------------------------------------------------------")
        print(f"{clock_string}Test number {test_number} - index = {index}\n")
        timestamp, tag_id, angle, tag_height = row
        print(f"{clock_string}Received data from packet:")
        print(f"{clock_string}TIME STAMP : {timestamp}")
        print(f"{clock_string}TAG id : {tag_id}")
        print(f"{clock_string}ANGLE : {angle}")
        print(f"{clock_string}HEIGHT : {tag_height}")
        print("-----------------------------------------------------------------")
        # Remove outdated entries
        # Clear all old timestamps out of the window
        tag_queue = data_store[tag_id]
        print(f"{clock_string}[Data Processing]: push in the tag_queue...")
        while tag_queue and tag_queue[0][0] < timestamp - time_window:
            print(f"{clock_string}[Data Processing]: TAG is not valid and pop from tag_queue...")
            tag_queue.popleft()
```

```
        # Add new entry
        tag_queue.append((timestamp, angle))
        print(f"{clock_string}[Data Processing]: TAG is valid and push in tag_queue...")

        # Compute median
        median_angle = statistics.median(pos for _, pos in tag_queue)

        # Store filtered data
        filtered_data.append([timestamp, tag_id, median_angle, tag_height])
        test_number +=1 # upgrade the test
    print(f"{sep}{clock_string}[Data Processing]: TAG queue print:\n",tag_queue)
    print(f"Number of valid samples: {len(tag_queue)}")
    print(f"Percentage of valid samples: {round(len(tag_queue) / test_number * 100,2)}%")

    return pd.DataFrame(filtered_data, columns=df.columns)


if __name__ == "__main__":
    # call the optional test of median_filter.py
    my_test()
```

```
[2025-04-13 14:04:57.225806]Input DataFrame PREVIEWER :
        timestamp            tag_id  angle  tag_height
0   1733062840000  4baf351178aa9b0e    -30         1.2
1   1733062840100  4baf351178aa9b0e    -28         1.2
2   1733062840200  4baf351178aa9b0e    -39         1.2
3   1733062840300  4baf351178aa9b0e    -27         1.2
4   1733062840400  4baf351178aa9b0e     -4         1.2
5   1733062840500  4baf351178aa9b0e    -25         1.2
6   1733062840600  4baf351178aa9b0e    -20         1.2
7   1733062840700  4baf351178aa9b0e     25         1.2
8   1733062840800  4baf351178aa9b0e     15         1.2
9   1733062840900  4baf351178aa9b0e     -2         1.2
10  1733062841000  4baf351178aa9b0e    -25         1.2
11  1733062841100  4baf351178aa9b0e      5         1.2
12  1733062841200  4baf351178aa9b0e     12         1.2
13  1733062841300  4baf351178aa9b0e     21         1.2
14  1733062841400  4baf351178aa9b0e     45         1.2
15  1733062841500  4baf351178aa9b0e     28         1.2
16  1733062841600  4baf351178aa9b0e     33         1.2
17  1733062841700  4baf351178aa9b0e    -65         1.2
18  1733062841800  4baf351178aa9b0e     32         1.2
19  1733062841900  4baf351178aa9b0e     25         1.2
20  1733062842000  4baf351178aa9b0e      5         1.2
21  1733062840000  a1b2c3d4e5f6g7h8     -1         1.1
22  1733062840100  a1b2c3d4e5f6g7h8     17         1.1
23  1733062840200  a1b2c3d4e5f6g7h8     16         1.1
24  1733062840300  a1b2c3d4e5f6g7h8     -8         1.1
25  1733062840400  a1b2c3d4e5f6g7h8     19         1.1
26  1733062840500  a1b2c3d4e5f6g7h8     20         1.1
27  1733062840600  a1b2c3d4e5f6g7h8      5         1.1
28  1733062840700  a1b2c3d4e5f6g7h8     15         1.1
29  1733062840800  a1b2c3d4e5f6g7h8     17         1.1
30  1733062840900  a1b2c3d4e5f6g7h8      6         1.1
31  1733062841000  a1b2c3d4e5f6g7h8     18         1.1
32  1733062841100  a1b2c3d4e5f6g7h8     19         1.1
33  1733062841200  a1b2c3d4e5f6g7h8     20         1.1
34  1733062841300  a1b2c3d4e5f6g7h8     17         1.1
35  1733062841400  a1b2c3d4e5f6g7h8     16         1.1
36  1733062841500  a1b2c3d4e5f6g7h8    -18         1.1
37  1733062841600  a1b2c3d4e5f6g7h8     19         1.1
38  1733062841700  a1b2c3d4e5f6g7h8     20         1.1
39  1733062841800  a1b2c3d4e5f6g7h8     30         1.1
40  1733062841900  a1b2c3d4e5f6g7h8      0         1.1
41  1733062842000  a1b2c3d4e5f6g7h8      0         1.1

                              ####################################

                                        Test    Number  1       Preview
                                ####################################

SETUP:
        data_store status -> defaultdict(<class 'collections.deque'>, {})
        data_filter status -> []



[Data Processing]: starting the Bluethoot Beacon Acquisition...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 1 - index = 0

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062840000
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : -30
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
```

```
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 2 - index = 1

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062840100
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : -28
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 3 - index = 2

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062840200
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : -39
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 4 - index = 3

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062840300
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : -27
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 5 - index = 4

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062840400
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : -4
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 6 - index = 5

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062840500
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : -25
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 7 - index = 6

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062840600
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : -20
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 8 - index = 7

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062840700
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : 25
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 9 - index = 8

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062840800
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : 15
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
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------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 10 - index = 9

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062840900
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : -2
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 11 - index = 10

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062841000
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : -25
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 12 - index = 11

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062841100
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : 5
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is not valid and pop from tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 13 - index = 12

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062841200
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : 12
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is not valid and pop from tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 14 - index = 13

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062841300
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : 21
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is not valid and pop from tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 15 - index = 14

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062841400
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : 45
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is not valid and pop from tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 16 - index = 15

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062841500
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : 28
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is not valid and pop from tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 17 - index = 16

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062841600
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : 33
```

```
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is not valid and pop from tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 18 - index = 17

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062841700
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : -65
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is not valid and pop from tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 19 - index = 18

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062841800
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : 32
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is not valid and pop from tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 20 - index = 19

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062841900
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : 25
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is not valid and pop from tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 21 - index = 20

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062842000
[2025-04-13 14:04:57.225806]TAG id : 4baf351178aa9b0e
[2025-04-13 14:04:57.225806]ANGLE : 5
[2025-04-13 14:04:57.225806]HEIGHT : 1.2
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is not valid and pop from tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 22 - index = 21

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062840000
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : -1
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 23 - index = 22

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062840100
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : 17
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 24 - index = 23

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062840200
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : 16
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 25 - index = 24
```

```
[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062840300
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : -8
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 26 - index = 25

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062840400
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : 19
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 27 - index = 26

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062840500
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : 20
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 28 - index = 27

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062840600
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : 5
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 29 - index = 28

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062840700
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : 15
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 30 - index = 29

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062840800
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : 17
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 31 - index = 30

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062840900
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : 6
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 32 - index = 31

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062841000
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : 18
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 33 - index = 32

[2025-04-13 14:04:57.225806]Received data from packet:
```

```
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062841100
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : 19
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is not valid and pop from tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 34 - index = 33

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062841200
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : 20
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is not valid and pop from tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 35 - index = 34

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062841300
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : 17
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is not valid and pop from tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 36 - index = 35

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062841400
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : 16
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is not valid and pop from tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 37 - index = 36

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062841500
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : -18
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is not valid and pop from tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 38 - index = 37

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062841600
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : 19
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is not valid and pop from tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 39 - index = 38

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062841700
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : 20
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is not valid and pop from tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 40 - index = 39

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062841800
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : 30
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
```

```
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is not valid and pop from tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 41 - index = 40

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062841900
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : 0
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is not valid and pop from tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
------------------------------------------------------------
[2025-04-13 14:04:57.225806]Test number 42 - index = 41

[2025-04-13 14:04:57.225806]Received data from packet:
[2025-04-13 14:04:57.225806]TIME STAMP : 1733062842000
[2025-04-13 14:04:57.225806]TAG id : a1b2c3d4e5f6g7h8
[2025-04-13 14:04:57.225806]ANGLE : 0
[2025-04-13 14:04:57.225806]HEIGHT : 1.1
------------------------------------------------------------
[2025-04-13 14:04:57.225806][Data Processing]: push in the tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is not valid and pop from tag_queue...
[2025-04-13 14:04:57.225806][Data Processing]: TAG is valid and push in tag_queue...
############################################################################################################[2025-04-13 14:0
4:57.225806][Data Processing]: TAG queue print:
 deque([(1733062841000, 18), (1733062841100, 19), (1733062841200, 20), (1733062841300, 17), (1733062841400, 16),
(1733062841500, -18), (1733062841600, 19), (1733062841700, 20), (1733062841800, 30), (1733062841900, 0), (1733062
842000, 0)])
Number of valid samples: 11
Percentage of valid samples: 25.58%

[2025-04-13 14:04:57.225806]Filtered DataFrame:
        timestamp            tag_id  angle  tag_height
0   1733062840000  4baf351178aa9b0e  -30.0         1.2
1   1733062840100  4baf351178aa9b0e  -29.0         1.2
2   1733062840200  4baf351178aa9b0e  -30.0         1.2
3   1733062840300  4baf351178aa9b0e  -29.0         1.2
4   1733062840400  4baf351178aa9b0e  -28.0         1.2
5   1733062840500  4baf351178aa9b0e  -27.5         1.2
6   1733062840600  4baf351178aa9b0e  -27.0         1.2
7   1733062840700  4baf351178aa9b0e  -26.0         1.2
8   1733062840800  4baf351178aa9b0e  -25.0         1.2
9   1733062840900  4baf351178aa9b0e  -22.5         1.2
10  1733062841000  4baf351178aa9b0e  -25.0         1.2
11  1733062841100  4baf351178aa9b0e  -20.0         1.2
12  1733062841200  4baf351178aa9b0e   -4.0         1.2
13  1733062841300  4baf351178aa9b0e   -2.0         1.2
14  1733062841400  4baf351178aa9b0e    5.0         1.2
15  1733062841500  4baf351178aa9b0e   12.0         1.2
16  1733062841600  4baf351178aa9b0e   15.0         1.2
17  1733062841700  4baf351178aa9b0e   15.0         1.2
18  1733062841800  4baf351178aa9b0e   15.0         1.2
19  1733062841900  4baf351178aa9b0e   21.0         1.2
20  1733062842000  4baf351178aa9b0e   21.0         1.2
21  1733062840000  a1b2c3d4e5f6g7h8   -1.0         1.1
22  1733062840100  a1b2c3d4e5f6g7h8    8.0         1.1
23  1733062840200  a1b2c3d4e5f6g7h8   16.0         1.1
24  1733062840300  a1b2c3d4e5f6g7h8    7.5         1.1
25  1733062840400  a1b2c3d4e5f6g7h8   16.0         1.1
26  1733062840500  a1b2c3d4e5f6g7h8   16.5         1.1
27  1733062840600  a1b2c3d4e5f6g7h8   16.0         1.1
28  1733062840700  a1b2c3d4e5f6g7h8   15.5         1.1
29  1733062840800  a1b2c3d4e5f6g7h8   16.0         1.1
30  1733062840900  a1b2c3d4e5f6g7h8   15.5         1.1
31  1733062841000  a1b2c3d4e5f6g7h8   16.0         1.1
32  1733062841100  a1b2c3d4e5f6g7h8   17.0         1.1
33  1733062841200  a1b2c3d4e5f6g7h8   17.0         1.1
34  1733062841300  a1b2c3d4e5f6g7h8   17.0         1.1
35  1733062841400  a1b2c3d4e5f6g7h8   17.0         1.1
36  1733062841500  a1b2c3d4e5f6g7h8   17.0         1.1
37  1733062841600  a1b2c3d4e5f6g7h8   17.0         1.1
38  1733062841700  a1b2c3d4e5f6g7h8   17.0         1.1
39  1733062841800  a1b2c3d4e5f6g7h8   18.0         1.1
40  1733062841900  a1b2c3d4e5f6g7h8   18.0         1.1
41  1733062842000  a1b2c3d4e5f6g7h8   18.0         1.1
############################################################################################################
 [2025-04-13 14:04:57.225806] Check of the Length:
 Input csv DF: 42
 Output csv DF: 42
```

In [ ]: