calibrate_data

January 11, 2021

[1]:
```
from ortho_lib3 import *
import os
import numpy as np
import plotly.express as px
```

[2]:
```
def translate_data(df):
    """
    Translate every frame so that thorax, sensor 2, has location 0,0,0
    df = dataframe to translate
    translate_df = dataframe with translated data
    """
    translate_df = df.copy(deep=True)
    translate_df['frame'].astype('int')
    frames = df['frame'].max()
    for f in range(frames+1):
        xyz_df = translate_df[(translate_df['frame'] == f) &␣
 ↪(translate_df['sensor'] == '3')]
        diff_x = 0 - xyz_df.iloc[0]['x']
        diff_y = 0 - xyz_df.iloc[0]['y']
        diff_z = 0 - xyz_df.iloc[0]['z']

        translate_df['x'] = np.where((translate_df.frame == f),␣
 ↪translate_df['x'] + diff_x, translate_df.x )
        translate_df['y'] = np.where((translate_df.frame == f),␣
 ↪translate_df['y'] + diff_y, translate_df.y )
        translate_df['z'] = np.where((translate_df.frame == f),␣
 ↪translate_df['z'] + diff_z, translate_df.z )

    return translate_df

def calculate_transform_factors(df):
    """
    Calculate transform factors
    df = dataframe to calculate factors from
    factor_x, factor_y, factor_z = factors to multiply every location with
    """
    transform_df = df.copy(deep=True)
    transform_df['frame'].astype('int')
    frames = transform_df['frame'].max()

    lengths = []
    diff_x = []
    diff_y = []
    diff_z = []

    for f in range(frames+1):
        xyz = transform_df[(transform_df['frame'] == f) &␣
↪((transform_df['sensor'] == '4') | (transform_df['sensor'] == '5'))]
        xyz = xyz.sort_values(['sensor'])

        x1 = xyz.iloc[0]['x']
        x2 = xyz.iloc[1]['x']
        y1 = xyz.iloc[0]['y']
        y2 = xyz.iloc[1]['y']
        z1 = xyz.iloc[0]['z']
        z2 = xyz.iloc[1]['z']

        length = np.sqrt(((x1 - x2)**2) + ((y1 - y2)**2) + ((z1 - z2)**2))
        lengths.append(length)

        diff_x.append(abs(x1-x2))
        diff_y.append(abs(y1-y2))
        diff_z.append(abs(z1-z2))

    for f in range(frames+1):
        xyz = transform_df[(transform_df['frame'] == f) &␣
↪((transform_df['sensor'] == '7') | (transform_df['sensor'] == '8'))]
        xyz = xyz.sort_values(['sensor'])

        x1 = xyz.iloc[0]['x']
        x2 = xyz.iloc[1]['x']
        y1 = xyz.iloc[0]['y']
        y2 = xyz.iloc[1]['y']
        z1 = xyz.iloc[0]['z']
        z2 = xyz.iloc[1]['z']

        length = np.sqrt(((x1 - x2)**2) + ((y1 - y2)**2) + ((z1 - z2)**2))
        lengths.append(length)

        diff_x.append(abs(x1-x2))
        diff_y.append(abs(y1-y2))
        diff_z.append(abs(z1-z2))

    mean_length = np.mean(np.array(lengths))
    mean_diff_x = np.mean(np.array(diff_x))
    mean_diff_y = np.mean(np.array(diff_y))
    mean_diff_z = np.mean(np.array(diff_z))

    factor_x = (mean_diff_x / mean_length) / mean_diff_x
    factor_y = (mean_diff_y / mean_length) / mean_diff_y
    factor_z = (mean_diff_z / mean_length) / mean_diff_z

    return factor_x, factor_y, factor_z

def transform_data(df, factor_x, factor_y, factor_z):
    """
    Transform every frame with factor_x, factor_y and factor_z
    df = dataframe to translate
    transform_df = dataframe with transformed
    """
    transform_df = df.copy(deep=True)
    transform_df['x'] = transform_df['x'] * factor_x
    transform_df['y'] = transform_df['y'] * factor_y
    transform_df['z'] = transform_df['z'] * factor_z

    return transform_df

def write_file(df, newfilename):
    """
    Write a new file for the new dataframe according to the raw data samples
    """
    with open(newfilename, 'w') as nfn:
        for index, row in df.iterrows():
            nfn.write(str(row['sensor']) + '   ' + str(row['x']) + '   ' +␣
 ↪str(row['y']) + '   ' + str(row['z']) + '\n\n')
            nfn.write('   ' + str(row['x0']) + '   ' + str(row['y0']) + '   ' +␣
 ↪str(row['z0']) + '\n\n')
            nfn.write('   ' + str(row['x1']) + '   ' + str(row['y1']) + '   ' +␣
 ↪str(row['z1']) + '\n\n')
            nfn.write('   ' + str(row['x2']) + '   ' + str(row['y2']) + '   ' +␣
 ↪str(row['z2']) + '\n\n\n\n')
```

1 Verwissel sensor 3 en 7

[13]:
```
def change_sensors(df):
    ndf = df.copy(deep=True)
    for index, row in ndf.iterrows():
        if row['sensor'] == '3':
            ndf.loc[index, 'sensor'] = '7'
        elif row['sensor'] == '7':
            ndf.loc[index, 'sensor'] = '3'
#          if row['sensor'] == '7':
#              ndf.loc[index, 'sensor'] = '9'
#          elif row['sensor'] == '9':
#              ndf.loc[index, 'sensor'] = '8'
    return ndf

def change_s(df):
    ndf = df.copy(deep=True)
    for index, row in ndf.iterrows():
        if row['sensor'] == '4':
            ndf.loc[index, 'sensor'] = '7'
        elif row['sensor'] == '7':
            ndf.loc[index, 'sensor'] = '4'
        if row['sensor'] == '5':
            ndf.loc[index, 'sensor'] = '8'
        elif row['sensor'] == '8':
            ndf.loc[index, 'sensor'] = '5'
        if row['sensor'] == '6':
            ndf.loc[index, 'sensor'] = '9'
        elif row['sensor'] == '9':
            ndf.loc[index, 'sensor'] = '6'
    return ndf
```

[14]:
```
file = 'sliced_original_data/Category_4'
cat = FilesCategory(file)
files = cat.fullpath(pat_id = 38)

for file in files:
    df = exercise_to_df_with_rotation(file, invert_z=True)
    df.reset_index(inplace=True, drop=True)
    df = change_sensors(df)
    df = change_s(df)
    df = translate_data(df)
    factor_x, factor_y, factor_z = calculate_transform_factors(df)
    df = transform_data(df, factor_x, factor_y, factor_z)

    directory = 'sliced_transformed_data/Category_4/38'

    if not os.path.exists(directory):
        os.makedirs(directory)

    newfilename = os.path.join(directory, file[-7:])
    write_file(df, newfilename)
    print('wrote file: ' + newfilename)
```

```
wrote file: sliced_transformed_data/Category_4/38/AB1.txt
wrote file: sliced_transformed_data/Category_4/38/AB2.txt
wrote file: sliced_transformed_data/Category_4/38/AF2.txt
wrote file: sliced_transformed_data/Category_4/38/AF1.txt
wrote file: sliced_transformed_data/Category_4/38/EL2.txt
wrote file: sliced_transformed_data/Category_4/38/EL1.txt
wrote file: sliced_transformed_data/Category_4/38/RF1.txt
wrote file: sliced_transformed_data/Category_4/38/RF2.txt
```

2 Transformeer alle files

[4]:
```
"""
Calibrate data and write new files
"""
categories = ['Category_1', 'Category_2', 'Category_3', 'Category_4']

for category in categories:
    cat = FilesCategory('sliced_original_testdata/' + category)

    for p in cat.get_patient_ids():

        for ex in cat.get_exercises(p):

            path = cat.fullpath(pat_id = p, exercise = ex)
            df = exercise_to_df_with_rotation(path, invert_z=True)
            ndf = translate_data(df)
            factor_x, factor_y, factor_z = calculate_transform_factors(ndf)
            tdf = transform_data(ndf, factor_x, factor_y, factor_z)

            directory = os.path.join('sliced_transformed_testdata/', category,␣
 ↪str(p))

            if not os.path.exists(directory):
                os.makedirs(directory)

            newfilename = os.path.join(directory, ex)
            write_file(tdf, newfilename)
            print('wrote file: ' + newfilename)
```

```
wrote file: sliced_transformed_testdata/Category_1/14/AB1.txt
wrote file: sliced_transformed_testdata/Category_1/14/AB2.txt
wrote file: sliced_transformed_testdata/Category_1/14/AF2.txt
wrote file: sliced_transformed_testdata/Category_1/14/AF1.txt
wrote file: sliced_transformed_testdata/Category_1/14/EL2.txt
wrote file: sliced_transformed_testdata/Category_1/14/EL1.txt
wrote file: sliced_transformed_testdata/Category_1/14/RF1.txt
wrote file: sliced_transformed_testdata/Category_1/14/RF2.txt
wrote file: sliced_transformed_testdata/Category_1/25/AB1.txt
wrote file: sliced_transformed_testdata/Category_1/25/AB2.txt
wrote file: sliced_transformed_testdata/Category_1/25/AF2.txt
wrote file: sliced_transformed_testdata/Category_1/25/AF1.txt
wrote file: sliced_transformed_testdata/Category_1/25/EL2.txt
wrote file: sliced_transformed_testdata/Category_1/25/EL1.txt
wrote file: sliced_transformed_testdata/Category_1/25/RF1.txt
wrote file: sliced_transformed_testdata/Category_1/25/RF2.txt
wrote file: sliced_transformed_testdata/Category_1/18/AB1.txt
wrote file: sliced_transformed_testdata/Category_1/18/AB2.txt
wrote file: sliced_transformed_testdata/Category_1/18/AF2.txt
wrote file: sliced_transformed_testdata/Category_1/18/AF1.txt
wrote file: sliced_transformed_testdata/Category_1/18/EL2.txt
wrote file: sliced_transformed_testdata/Category_1/18/EL1.txt
wrote file: sliced_transformed_testdata/Category_1/18/RF1.txt
wrote file: sliced_transformed_testdata/Category_1/18/RF2.txt
wrote file: sliced_transformed_testdata/Category_2/17/AB1.txt
wrote file: sliced_transformed_testdata/Category_2/17/AB2.txt
wrote file: sliced_transformed_testdata/Category_2/17/AF2.txt
wrote file: sliced_transformed_testdata/Category_2/17/AF1.txt
wrote file: sliced_transformed_testdata/Category_2/17/EL2.txt
wrote file: sliced_transformed_testdata/Category_2/17/EL1.txt
wrote file: sliced_transformed_testdata/Category_2/17/RF1.txt
wrote file: sliced_transformed_testdata/Category_2/17/RF2.txt
wrote file: sliced_transformed_testdata/Category_2/25/AB1.txt
wrote file: sliced_transformed_testdata/Category_2/25/AB2.txt
wrote file: sliced_transformed_testdata/Category_2/25/AF2.txt
wrote file: sliced_transformed_testdata/Category_2/25/AF1.txt
wrote file: sliced_transformed_testdata/Category_2/25/EL2.txt
wrote file: sliced_transformed_testdata/Category_2/25/EL1.txt
wrote file: sliced_transformed_testdata/Category_2/25/RF1.txt
wrote file: sliced_transformed_testdata/Category_2/25/RF2.txt
wrote file: sliced_transformed_testdata/Category_2/12/AB1.txt
wrote file: sliced_transformed_testdata/Category_2/12/AB2.txt
wrote file: sliced_transformed_testdata/Category_2/12/AF2.txt
wrote file: sliced_transformed_testdata/Category_2/12/AF1.txt
wrote file: sliced_transformed_testdata/Category_2/12/EL2.txt
wrote file: sliced_transformed_testdata/Category_2/12/EL1.txt
wrote file: sliced_transformed_testdata/Category_2/12/RF1.txt
wrote file: sliced_transformed_testdata/Category_2/12/RF2.txt
wrote file: sliced_transformed_testdata/Category_3/39/AB1.txt
wrote file: sliced_transformed_testdata/Category_3/39/AB2.txt
wrote file: sliced_transformed_testdata/Category_3/39/AF2.txt
wrote file: sliced_transformed_testdata/Category_3/39/AF1.txt
wrote file: sliced_transformed_testdata/Category_3/39/EL2.txt
wrote file: sliced_transformed_testdata/Category_3/39/EL1.txt
wrote file: sliced_transformed_testdata/Category_3/39/RF1.txt
wrote file: sliced_transformed_testdata/Category_3/39/RF2.txt
wrote file: sliced_transformed_testdata/Category_3/30/AB1.txt
wrote file: sliced_transformed_testdata/Category_3/30/AB2.txt
wrote file: sliced_transformed_testdata/Category_3/30/AF2.txt
wrote file: sliced_transformed_testdata/Category_3/30/AF1.txt
wrote file: sliced_transformed_testdata/Category_3/30/EL2.txt
wrote file: sliced_transformed_testdata/Category_3/30/EL1.txt
wrote file: sliced_transformed_testdata/Category_3/30/RF1.txt
wrote file: sliced_transformed_testdata/Category_3/30/RF2.txt
wrote file: sliced_transformed_testdata/Category_3/16/AB1.txt
wrote file: sliced_transformed_testdata/Category_3/16/AB2.txt
wrote file: sliced_transformed_testdata/Category_3/16/AF2.txt
wrote file: sliced_transformed_testdata/Category_3/16/AF1.txt
wrote file: sliced_transformed_testdata/Category_3/16/EL1.txt
wrote file: sliced_transformed_testdata/Category_3/16/RF1.txt
wrote file: sliced_transformed_testdata/Category_3/16/RF2.txt
wrote file: sliced_transformed_testdata/Category_4/13/AB1.txt
wrote file: sliced_transformed_testdata/Category_4/13/AB2.txt
wrote file: sliced_transformed_testdata/Category_4/13/AF2.txt
wrote file: sliced_transformed_testdata/Category_4/13/AF1.txt
wrote file: sliced_transformed_testdata/Category_4/13/EL1.txt
wrote file: sliced_transformed_testdata/Category_4/13/RF1.txt
wrote file: sliced_transformed_testdata/Category_4/13/RF2.txt
wrote file: sliced_transformed_testdata/Category_4/37/AB1.txt
wrote file: sliced_transformed_testdata/Category_4/37/AB2.txt
wrote file: sliced_transformed_testdata/Category_4/37/AF2.txt
wrote file: sliced_transformed_testdata/Category_4/37/AF1.txt
wrote file: sliced_transformed_testdata/Category_4/37/EL2.txt
wrote file: sliced_transformed_testdata/Category_4/37/EL1.txt
wrote file: sliced_transformed_testdata/Category_4/37/RF1.txt
wrote file: sliced_transformed_testdata/Category_4/37/RF2.txt
wrote file: sliced_transformed_testdata/Category_4/28/AB1.txt
wrote file: sliced_transformed_testdata/Category_4/28/AF1.txt
wrote file: sliced_transformed_testdata/Category_4/28/EL1.txt
wrote file: sliced_transformed_testdata/Category_4/28/RF1.txt
```

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[ ]:
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