Final Project MATH 2303

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We have 256 data values indicating the daily testing numbers for Covid in the Czech Republic over a certain time period.

Perform the Haar transform to compress the data to 128 data values.
perform the Haar transform to compress the data yet again to 64 data values.
And continue.

Write a report with your results and interpretation.

Introduction: This data analysis summary analyzes the increase in COVID testing numbers over a period of 256 days in the Czech Republic.

```
SS = 0; % scalescale (flag)
DS = 1; % detailscale (flag)
SD = 2; % scaledetail (flag)
DD = 3; % detaildetail (flag)

disp('preview of our data')
opts = detectImportOptions('CzechRepublicCovidTesting.xlsx');
preview('CzechRepublicCovidTesting.xlsx',opts)
```

```
ans =

  8×2 table
```

date	DailyTestingNumbers
27-Jan-2020	20
28-Jan-2020	8
29-Jan-2020	5
30-Jan-2020	1
31-Jan-2020	3
01-Feb-2020	1
02-Feb-2020	5
03-Feb-2020	5

Figure 1: The column DailyTestingNumbers is the 256 data points we will use.

```
% We let Matrix S_256 represent the Daily Testing Numbers
S_256 = [20;
```

In S_{256} We have 256 data points, each representing the number of Covid test cases for the respective day. We want to report 128 neighbouring data points which will give us the QAD 'every other day' Covid numbers. Averaging the neighbouring days yeilds, S_{128}, we can think of these data points as the coarse trend extracted from our original 256 data points.

```
S_128 = coarsesplit(S_256, SS);
plot(S_128)
```

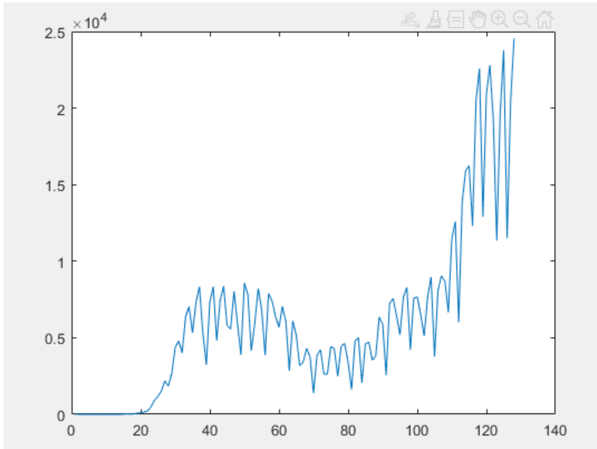

Figure 2: S_{128}

Now that we have extracted the coarse trend we will extract the detail SD from the S_{256} data points. The detail D_{128} datapoints will be the differences in the daily covid test cases. To get the D_{128} data we take the consecutive differences in the daily covid cases.

```
D_128 = coarsesplit(S_256, SD);
plot(D_128)
```

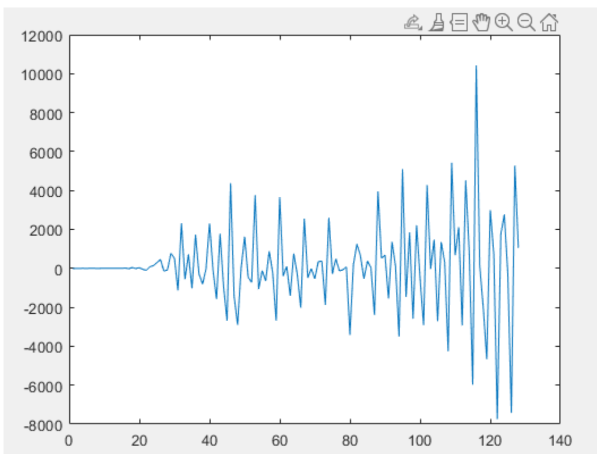

Figure 3: D_{128}

We continue this to create the rest of the S_n coarse data and the D_n detail data from the S_{n+1} data yeilding the following.

```
S_64 = coarsesplit(S_128, SS);
plot(S_64)
```

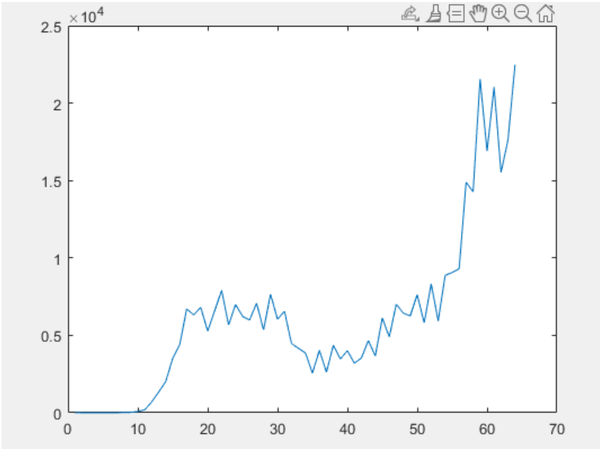

Figure 4: S_{64}

```
D_64 = coarsesplit(S_128, SD);
plot(D_64)
```

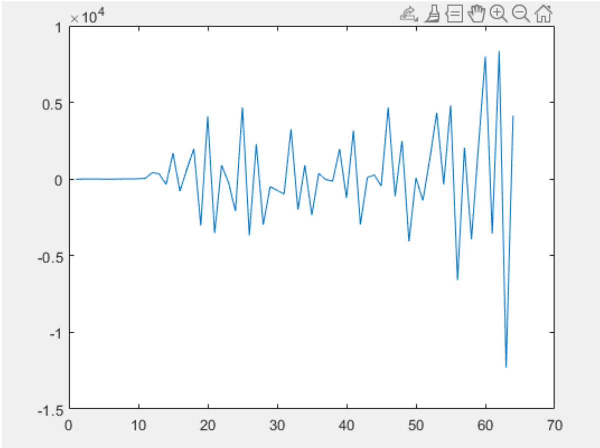

Figure 5: D_{64}

```
S_32 = coarsesplit(S_64, SS);
plot(S_32)
```

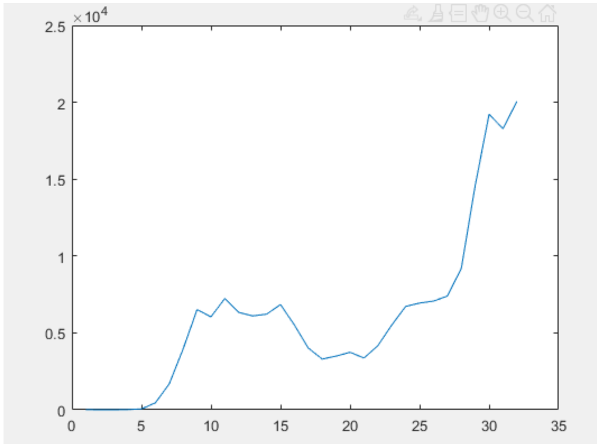

Figure 6: S_{32}

```
D_32 = coarsesplit(S_64, SD);
plot(D_32)
```

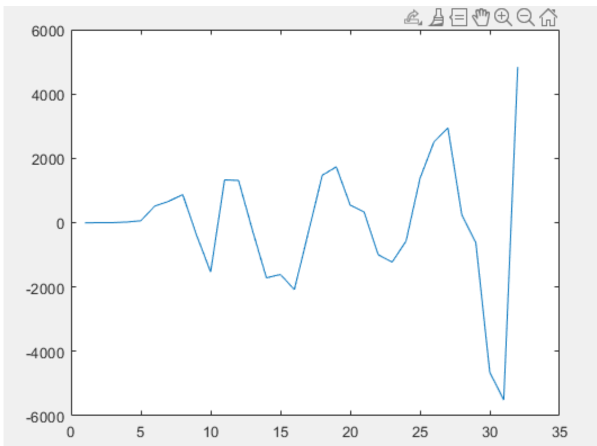

Figure 7: D_{32}

```
S_16 = coarsesplit(S_32, SS);
plot(S_16)
```

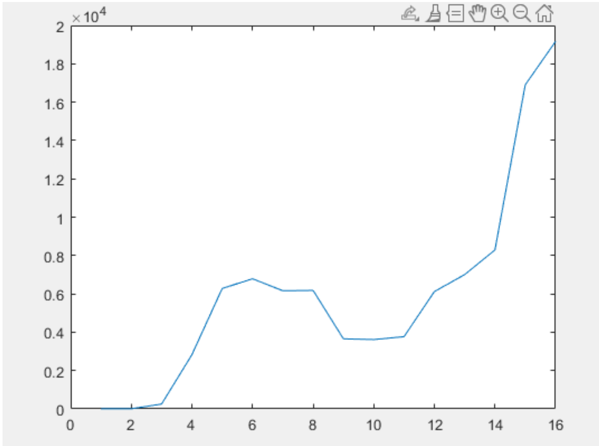

Figure 8: S_{16}

```
D_16 = coarsesplit(S_32, SD);
plot(D_16)
```

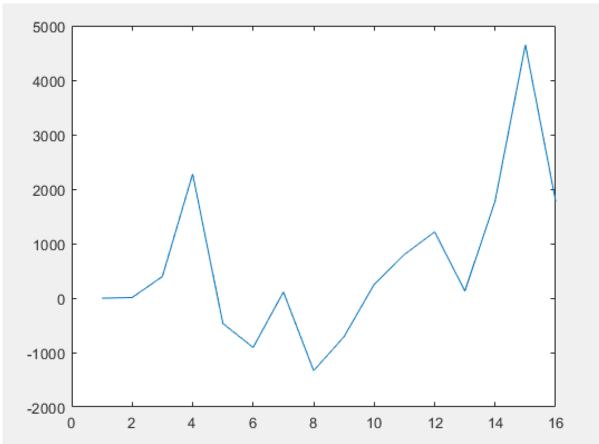

Figure 9: D_{16}

```
S_8 = coarsesplit(S_16, SS);
plot(S_8)
```

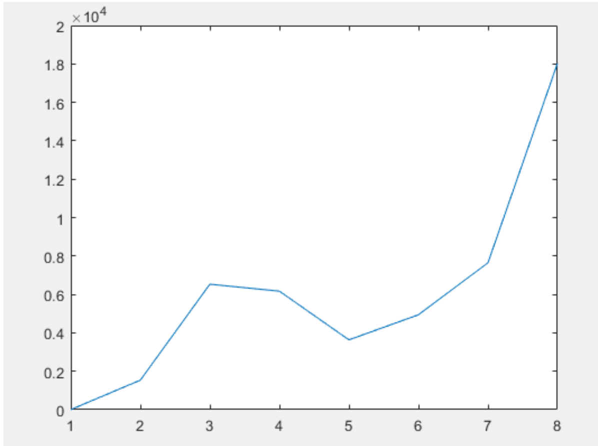

Figure 10: S_8

```
D_8 = coarsesplit(S_16, SD);
plot(D_8)
```

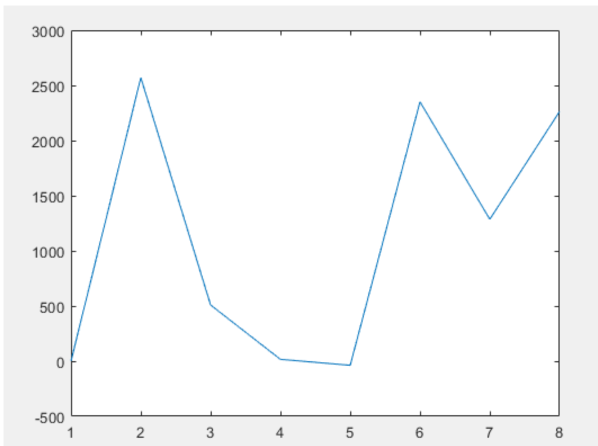

Figure 11: D_8

```
S_4 = coarsesplit(S_8, SS);
plot(S_4)
```

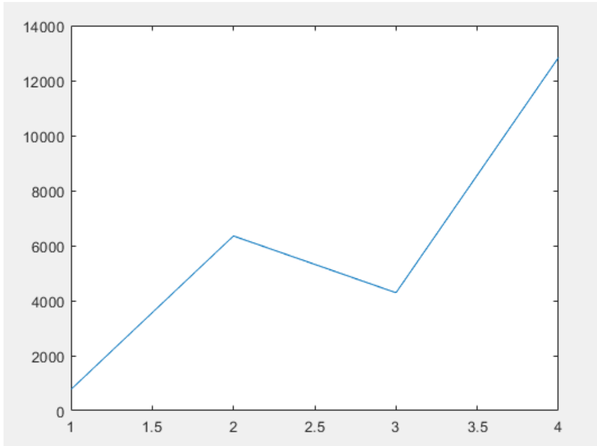

Figure 12: S_4

```
D_4 = coarsesplit(S_8, SD);
plot(D_4)
```

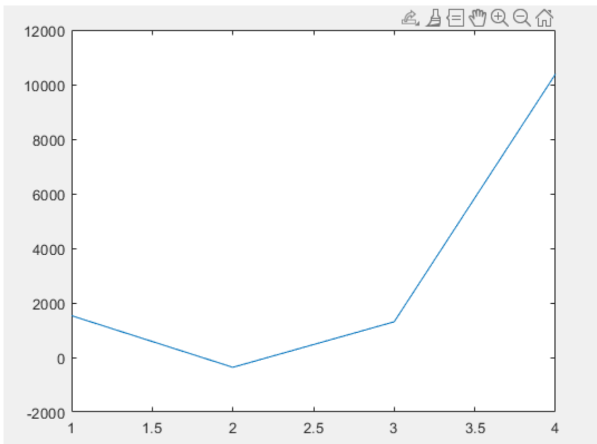

Figure 13: D_4

```
S_2 = coarsesplit(S_4, SS);
plot(S_2)
```

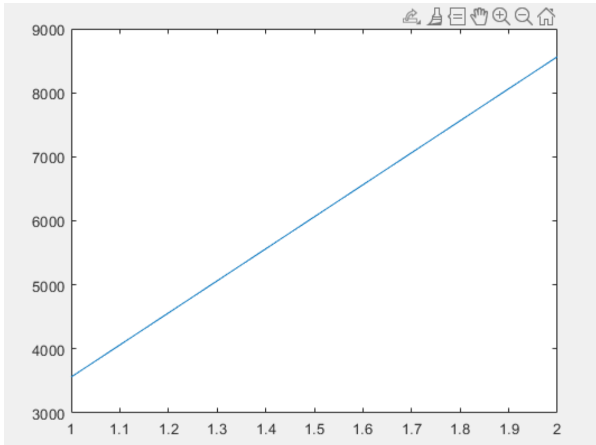

Figure 14: S_2

```
D_2 = coarsesplit(S_4, SS);
plot(D_2)
```

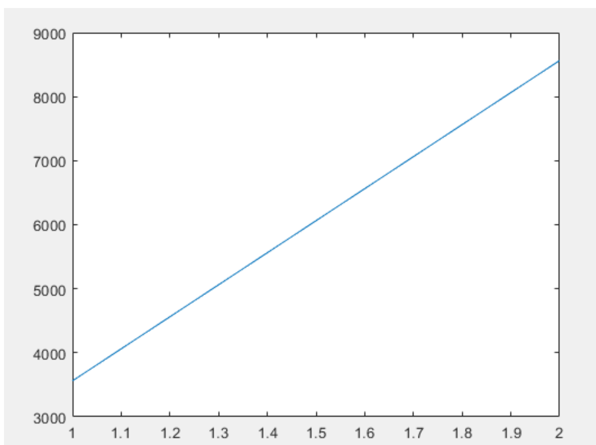

Figure 15: D_2

This overall trend is just the average of the original data points.

```
S_0 = coarsesplit(S_2, SS)
```

```
>> S_0 = coarsesplit(S_2, SS)

S_0 =

    6.0629e+03
```

Figure 16: S_0

with the detail

```
D_0 = coarsesplit(S_2, SD)
```

```
>> D_0 = coarsesplit(S_2, SD)

D_0 =

    5.0033e+03
```

Figure 17: D_0

Conclusion: This shows us the coarser trends in the covid testing data, by focusing on these we get the general trends by removing the fluctuations. This reveals details in the data that can be interpreted theoretically, with the average number of daily covid tests $\approxeq 5000$ per day.