# Bset 0 playing with accelerometer data

In[1]:=
```
SetDirectory[NotebookDirectory[]];
Import["../General.m"];
```

---

## 2b pushing phone on table

In[3]:=
```
$2bRaw = Import["pushY.csv", "Data"];
{"time", "x", "y", "z", "gforce"};
```

In[5]:=
```
$2bHeader = $2bRaw[[1]]
$2bData = $2bRaw[[2 ;; Length[$2bRaw] - 2]];
```

Out[5]=
```
{time, x, y, z, gforce}
```

### Data came with strange white space, so clean it up!

In[7]:=
```
cleanData[x_] := Module[{}, If[Length[x] ≠ 4, {0, 0, 0, 0}, x]]
```

In[8]:=
```
$2bCleanData = Map[cleanData, $2bData];
```

In[9]:=
```
Dimensions[$2bData]
Dimensions[$2bCleanData]
```

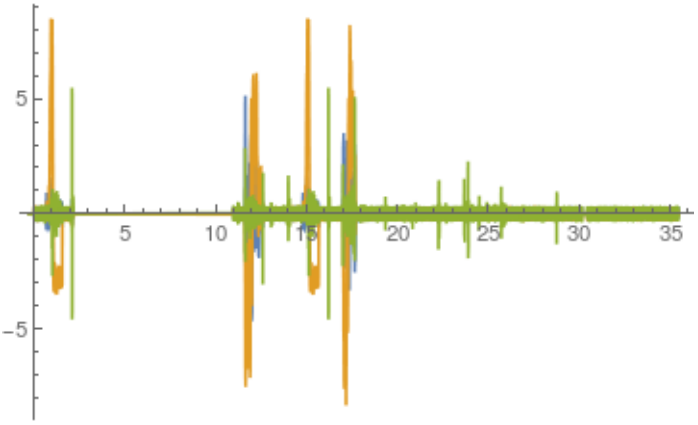
Out[9]=
```
{5290}
```

Out[10]=
```
{5290, 4}
```

## Let's see what all three accelerations look like

In[11]:=
```
Rasterize@ListLinePlot[{$2bCleanData[[All, {1, 2}]],
   $2bCleanData[[All, {1, 3}]], $2bCleanData[[All, {1, 4}]]}, PlotRange → All]
```

Out[11]=

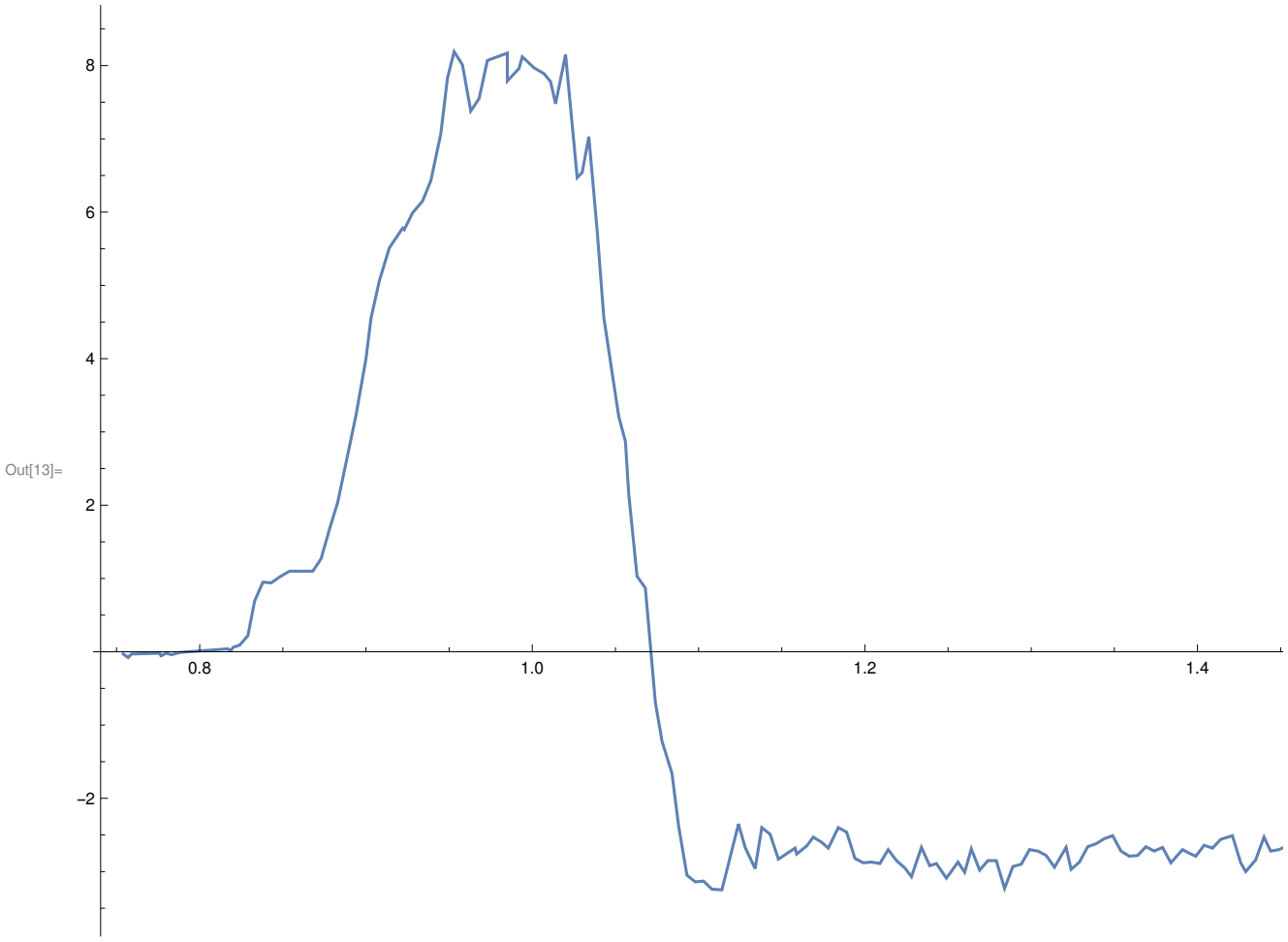



## Let's make a clear graph of just the push. We can see that the hand pushes the phone from .8 seconds to 1.07 seconds. After that, it decelerates at a constant rate

In[12]:=
```
$2bPush = $2bCleanData[[All, {1, 3}]][[150 ;; 325]];
```

In[13]:=
```
ListLinePlot[$2bPush, PlotRange → Full]
```

Out[13]=



Now, we using our data, we can calculate the velocity at any point in time using the previous velocity, the acceleration, and the time step.

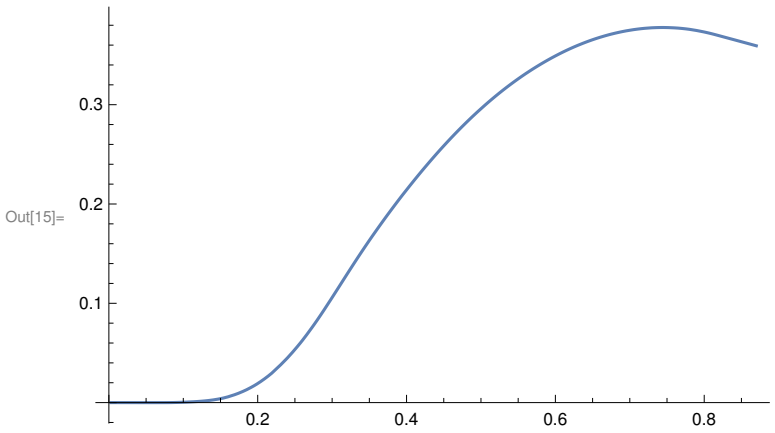
Position takes in a list containing tuples of times and accelerations. It returns a list of tuples containing times and positions. It should probably be separated into smaller functions at some point.

In[14]:=
```
position[data_] := Module[{n, timesteps, deltaVelocity, velocityAtIndex,
    lengthTimesteps, deltaDistances, timeAtIndex, distanceAtIndex},
  n = Length[data];
  timesteps = data[[2 ;; n, 1]] - data[[1 ;; n - 1, 1]];
  deltaVelocity = data[[2 ;; n, 2]] * timesteps;
  lengthTimesteps = Length[timesteps];
  velocityAtIndex = Table[Total@deltaVelocity[[1 ;; i]], {i, lengthTimesteps}];
  deltaDistances = velocityAtIndex * timesteps;
  timeAtIndex = Table[Total@timesteps[[1 ;; i]], {i, lengthTimesteps}];
  distanceAtIndex = Table[Total@deltaDistances[[1 ;; i]], {i, lengthTimesteps}];
  Return[Transpose@{timeAtIndex, distanceAtIndex}]
 ]
```

Plot of my position over time in a single direction. At the end, it looks like the phone has moved backwards. There could be a couple reasons for this. I think the phone was sensing accelerations in different directions as it slightly rotated. However, overall, the graph looks pretty good.

In[15]:=
```
ListLinePlot[position[$2bPush]]
```

Out[15]=




# 1a

In[16]:=
```
$1aRaw = Import["walking.csv", "Data"];
{"time", "x", "y", "z", "gforce"};
```

In[18]:=
```
$1aHeader = $1aRaw[[1]]
$1aData = $1aRaw[[2 ;; Length[$1aRaw] - 2]];
```

Out[18]= {time, x, y, z}

## Data came with strange white space, so clean it up!

In[20]:=
```
$1aCleanData = Map[cleanData, $1aData];
```

In[21]:=
```
Dimensions[$1aData]
Dimensions[$1aCleanData]
```

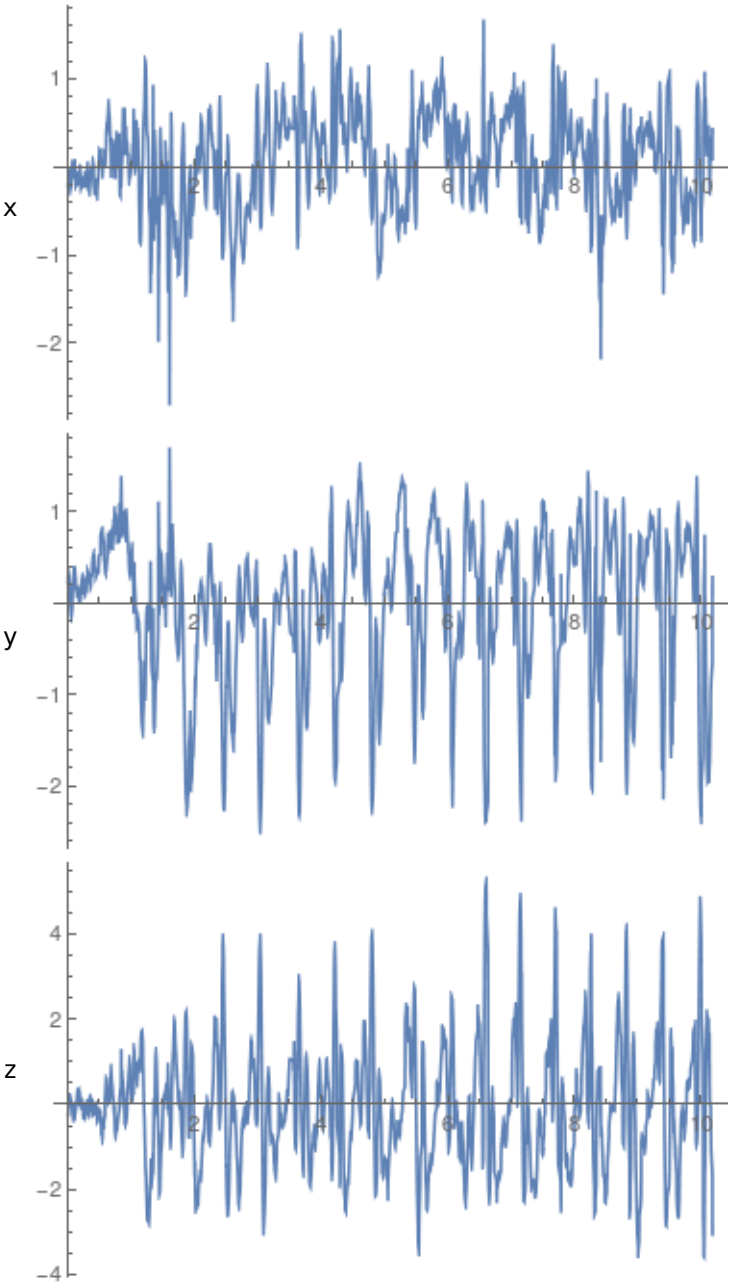
Out[21]= {2030, 4}

Out[22]= {2030, 4}

## Let's see what all three accelerations look like

In[23]:=
```
Grid[Transpose@{{"x", "y", "z"}, Table[Rasterize@
    ListLinePlot[$1aCleanData[[All, {1, n}]], PlotRange → All], {n, {2, 3, 4}}]}]
```

Out[23]=

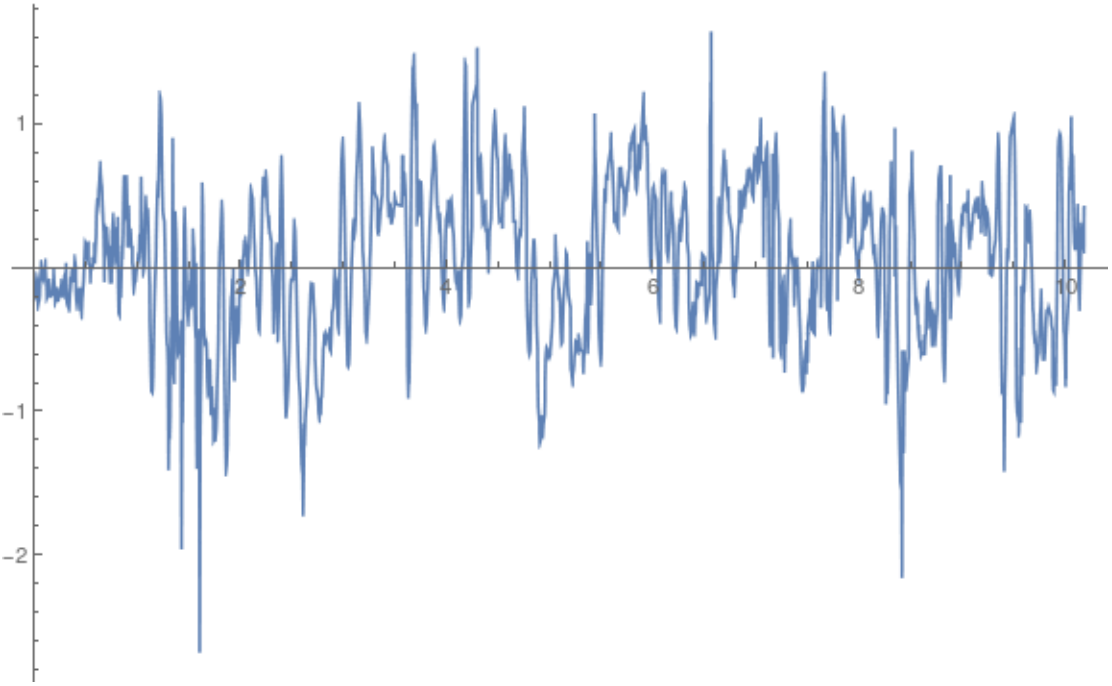


Let's make a clear graph of the walk. We can see that the walk ends around 10 seconds. After that, it was corrupted from doing other commands on the phone.

In[36]:=
```
$1aWalk = $1aCleanData[[All, {1, 2}]];
```

In[37]:=
```
Rasterize@ListLinePlot[$1aWalk, PlotRange → Full, ImageSize → Large]
```

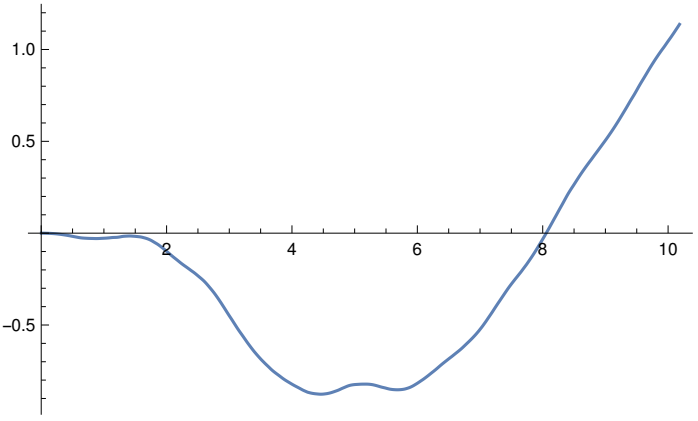
Out[37]=




Given that I walked about 10 meters, I think my calculations might be a bit off somewhere.

In[38]:=
```
ListLinePlot@position[$1aWalk]
```

Out[38]=




This bset was fun and interesting. I'm still not sure whether or not my

distance calculations were wrong because I wasn't understanding my data correctly, or if my phone wasn't giving out great data. It definitely seemed that my method of calculating position worked much better over a short period than a long period. I probably needed to use a high pass filter.

In[75]:=
```
exportNotebookPDF[]
```