

Kinect App Development



KINECT™
for  XBOX 360.

By
Rishabh Maheshwari

Objective of today's lecture

Play Angry Birds in 3D



What's an image ?

An image is simply a collection of pixels, each of which contains some data.

(A pixel is characterized by (x,y))

Let us see some types of images...

Binary Image

Each Pixel has either 1 (White) or 0 (Black)

Each pixel has 1 bit information

(Binary images are seldom used)

0	0	0	0	0	0	0
0	0	1	1	1	0	0
0	0	1	1	1	0	0
0	0	1	1	1	0	0
0	0	1	1	1	0	0
0	0	0	0	0	0	0



Grayscale

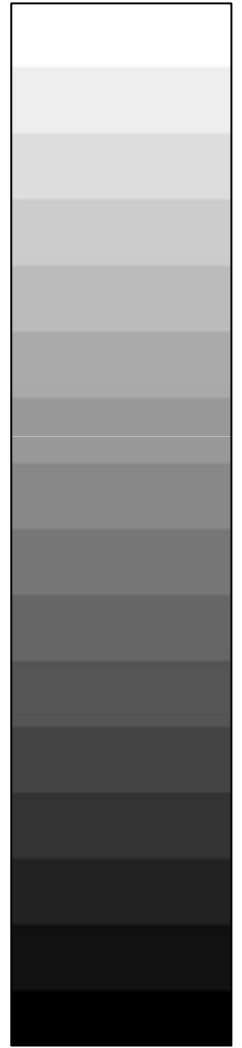
Each Pixel has a value from 0 to 255.

0 : black and 255 : White

Between 0 and 255 are shades of b&w.

Each pixel has 1 byte information

It is stored as an **array of bytes**.



Grayscale Image



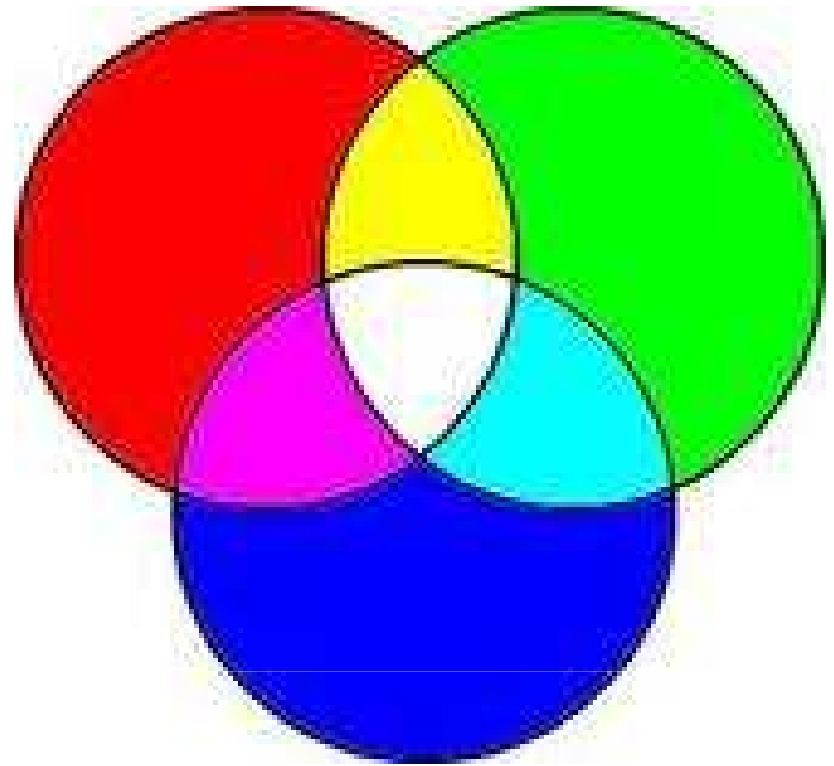
RGB Image

Each Pixel stores 3 values :-

R : 0- 255

G: 0 -255

B : 0-255



Each pixel has 3 bytes of information

It is also stored as an **array of bytes**.

RGB image



Before moving to depth image, we must familiarize ourselves with the basics of kinect.

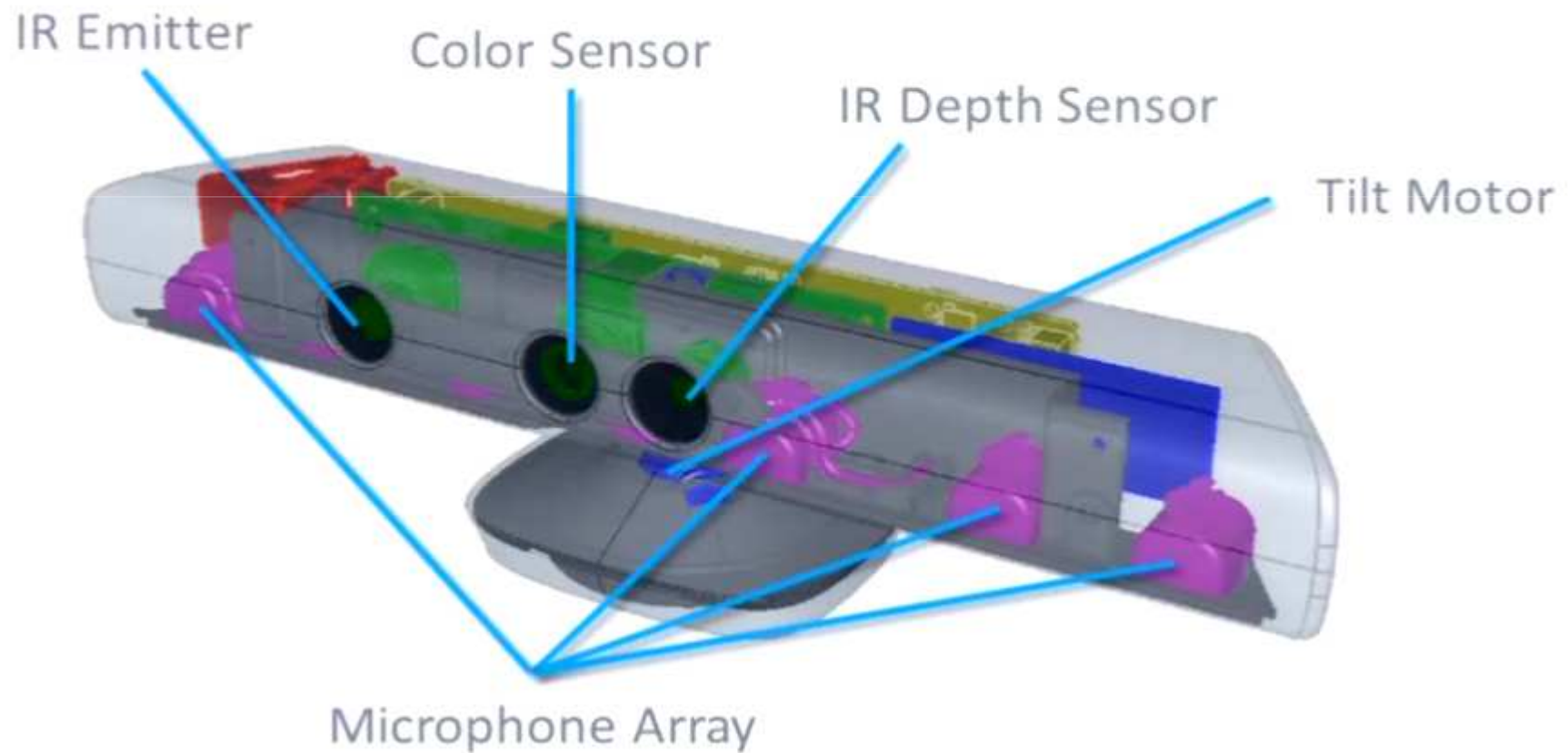
What is a kinect camera ?

Kinect is a camera which gives R , G , B and depth information of each pixel.

How does Kinect work?

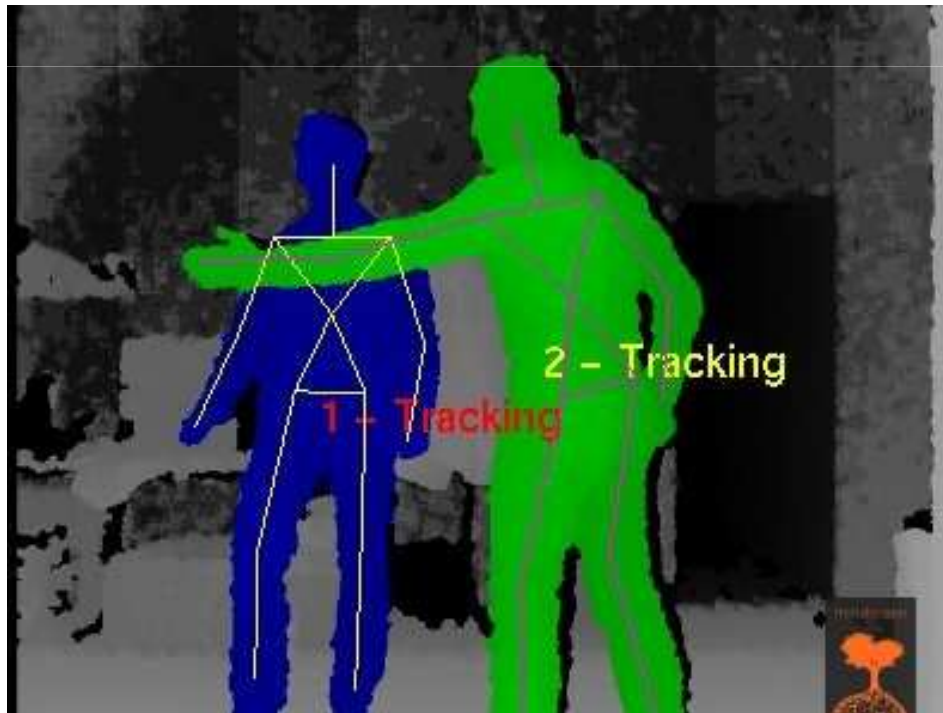
Kinect has 3 components :-

- color camera (takes RGB values)
- IR camera (takes depth data)
- Microphone array (for speech recognition)



Player

A player is the (human) skeleton which is detected by kinect. There can be multiple players. Each pixel stores the corresponding “player index”.



■ Player index = 1

■ Player index = 2

By default:-
Player index = 0

Depth Image (Specific To Kinect sdk v1)

Each pixel stores :-

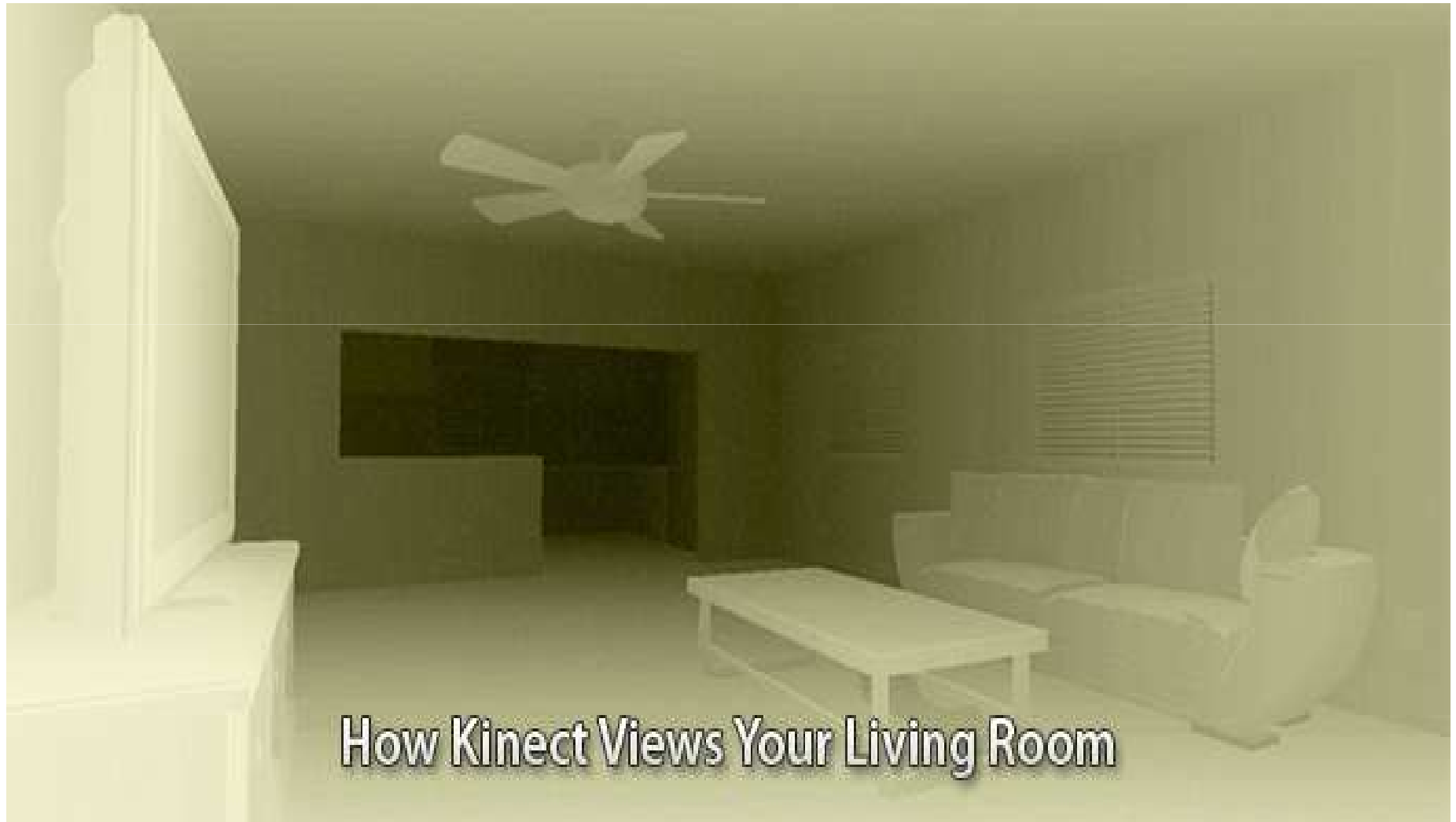
- Player index : 0 – 7 (3 bits)
- Depth(in mm) : 0 – 8192 (13 bits)

It is stored as an **array of shorts**.

(A short is a 16 bit data type)



Depth Image



Some important datatypes:-

- Kinect is defines as a datatype (same as int or char)

```
KinectSensor _kinect;
```

- Kinect sdk can handle multiple kinects at same time and treats these kinects as an array of kinect datatype :-

```
_kinect =KinectSensor.KinectSensors[0];
```

- DepthImagePoint is a struct which stores X , Y and Depth of a point :-

```
DepthImagePoint xyz;
```

You can use: xyz.X xyz.Y xyz.Depth

Kinect has 3 streams :-

- ColorStream (contains RGB data as byte array)
- DepthStream (contains depth data as short array)
- SkeletonStream (a template)

All these streams are enabled when the program is loaded:-

```
_kinect.ColorStream.Enable();  
_kinect.DepthStream.Enable();  
_kinect.SkeletonStream.Enable();  
_kinect.Start();
```

What is a SkeletonStream ?

When skeletonstream is called , it recognizes skeletons and **populates pixels of depthstream with player index.**

*If skeletonstream is not enabled, player index of all pixels of depthstream will remain 0.

Joints

Using skeletonstream,
kinect sdk provides us with
20 joints.

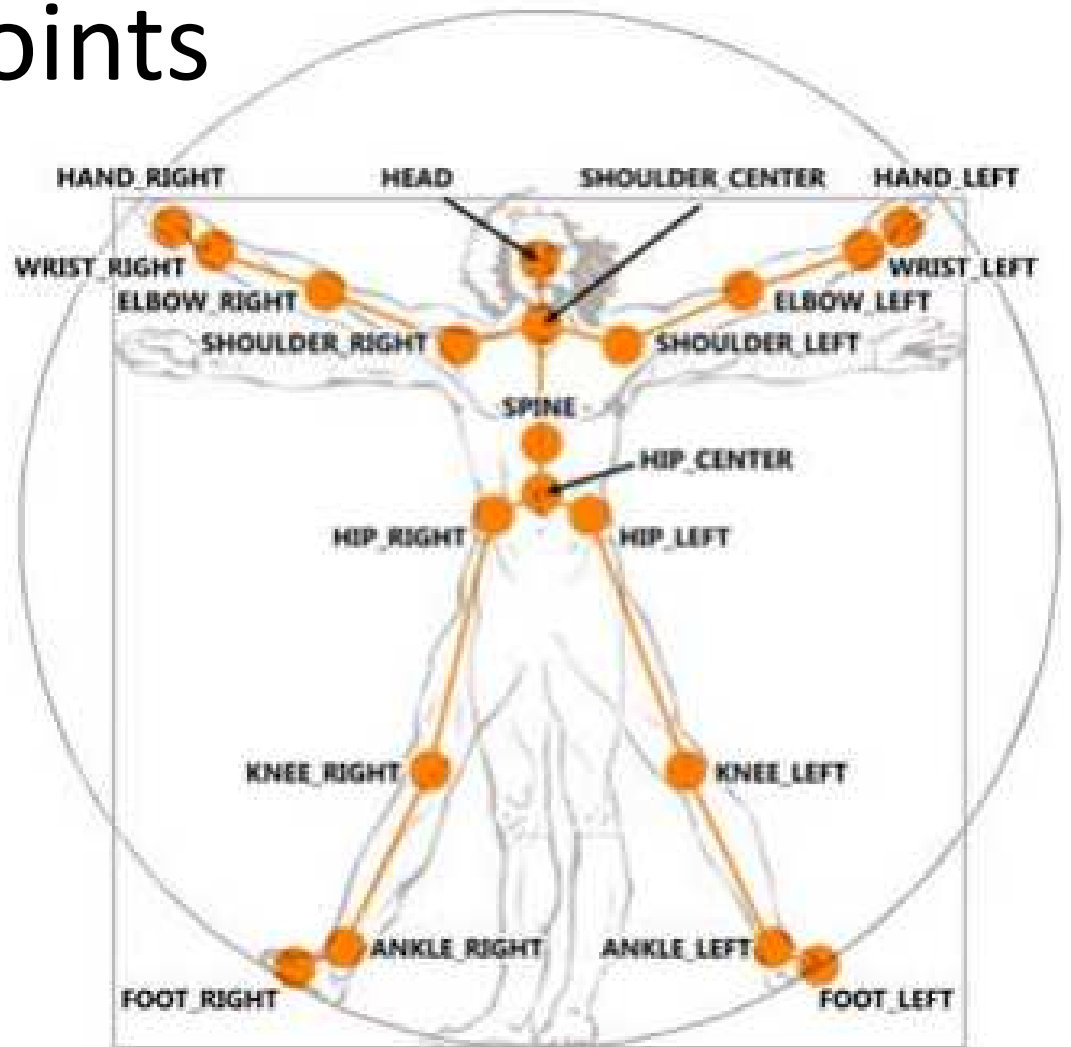
Eg:-

`JointType.HandRight`

`JointType.FootLeft`

`JointType.ShoulderLeft`

.....



Code for taking joint information :-

```
DepthImagePoint righthand  
=_depthframe.MapFromSkeletonPoint(defaultskeleton.  
Joints[JointType.HandRight].Position);
```

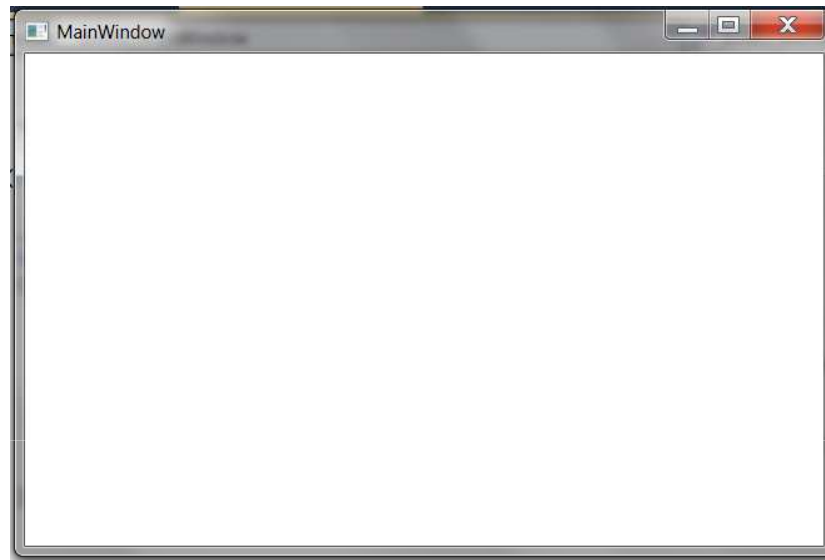
Now you can use X , Y and depth of the joint:-

- righthand.X
- righthand.Y
- righthand.Depth

Let's start with coding

1. Install visual studio.
2. Install kinect sdk for visual studio.
3. Select New Project
4. In C# projects, select WPF project
5. Add Microsoft.Kinect in reference of your project.
6. Write `using Microsoft.Kinect;`

As you open your new project, a default window is provided.



There are 2 events associated with this window:-

Window_Loaded() // when window loads

Window_Closing() // When  is pressed

The Final basic code:-

```
KinectSensor _kinect;
```

```
Window_Loaded()
```

```
{
```

```
    _kinect = KinectSensor.KinectSensors[0];
```

```
    _kinect.ColorStream.Enable();
```

```
    _kinect.DepthStream.Enable();
```

```
    _kinect.SkeletonStream.Enable();
```

```
    _kinect.Start();
```

```
}
```

```
Window_Closing()
```

```
{
```

```
    _kinect.Stop();
```

```
}
```

Lets see the code to understand
more about “frame events”

Questions ?

For online video lectures :-

<http://channel9.msdn.com/Series/KinectQuickstart>