

MISC02 – Natural User Interface KINECT for WINDOWS

Renato Marzaro – Microsoft Visual Basic MVP

renato.marzaro@visual-basic.it

@RenMarz

<http://community.visual-basic.it/renato>

Visual Basic tips&tricks

Dal 1996 la community su VB e VB.NET

MVP

Microsoft®
Most Valuable
Professional

Grazie a

5Dlabs.it

Microsoft
Visual Studio
with MSDN Subscription

OverNet
EDUCATION

Sponsor

Windows Internet
Explorer 9

SOL Server
LIFESTYLE
Proactively. Reactively.

Powered by
Windows Azure

Windows Phone
Put people first.

icubed

HOEPLI
INFORMATICA

aspitalia.com

DomusDotNet

DotDotNet



DotNet
Liguria

DotNET

dotnet
MARCHE

DotNetSide

GUISA
Gruppo Utenti Italiani
Solution Architect

sharepointcommunity.it

UGIdotNET

Visual Basic tips&tricks
Dal 1996 la community su VB e VB.NET

Agenda

- NUI (Natural User Interface)
- Panoramica su Kinect
- Kinect SDK
- Demo



Evoluzione UI - Testo

Interactive repository commands:

```
menu <reponame> <search_regex>
menu-desc <reponame> <search_regex>
menu-updates <reponame>
menu-dir <directory>
```

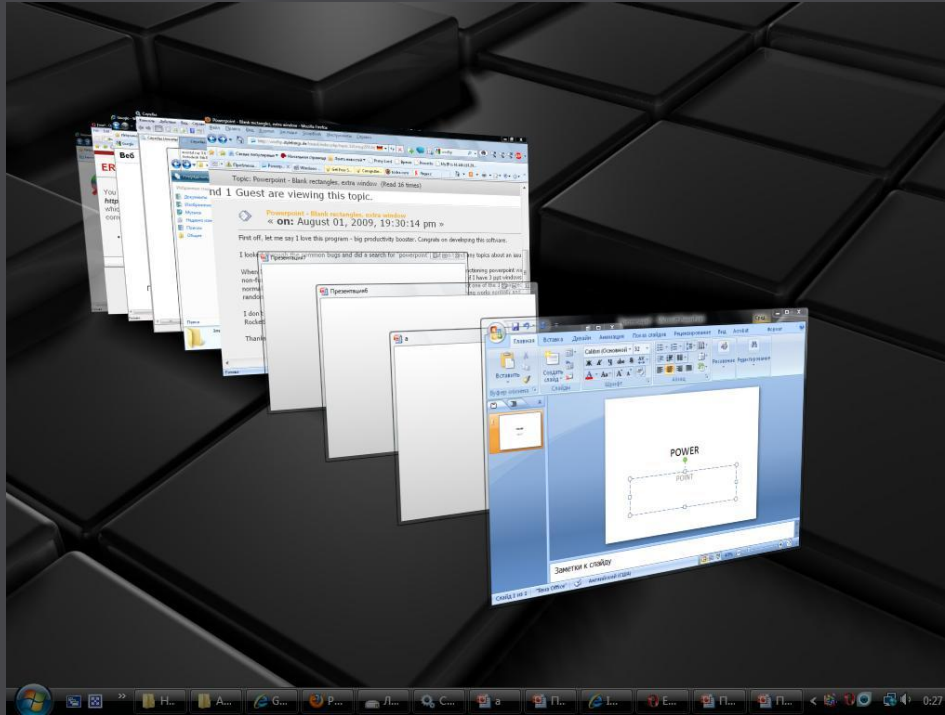
Non-interactive repository commands i.e. they ask nothing from the user:

```
list
add <reponame> <address>
delete <reponame>
rename <reponame> <newname>
address <reponame> <newaddress>
update <reponame>
search <reponame> <search_regex>
search-desc <reponame> <search_regex>
install <reponame> <full_package_name>
list-updates <reponame>
install-updates <reponame>
```

If no command is specified pkgtool starts with the interactive dialog mode.

```
root@fsc2400:/home/larhzu# █
```

Evoluzione UI - Grafica



Evoluzione UI - Touch



Evoluzione UI - TouchLess



Evoluzione UI - Riconoscimento



Panoramica su Kinect

- Sensori e Componenti
- Architettura HardWare
- Come Funziona



Kinect - Esterno

- Camera VGA 640x480 (CMOS).
- Infrared Camera 640x480 (CMOS).
- Infrared Projector
- Motorized Tilt.
- Array of 4 Microphones

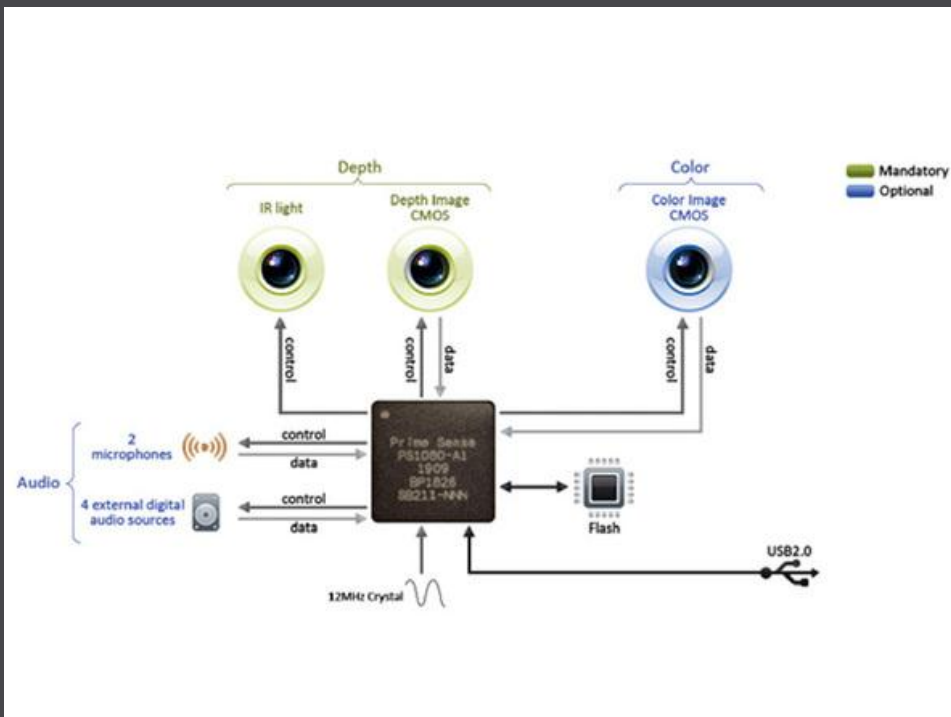


Kinect - Interno

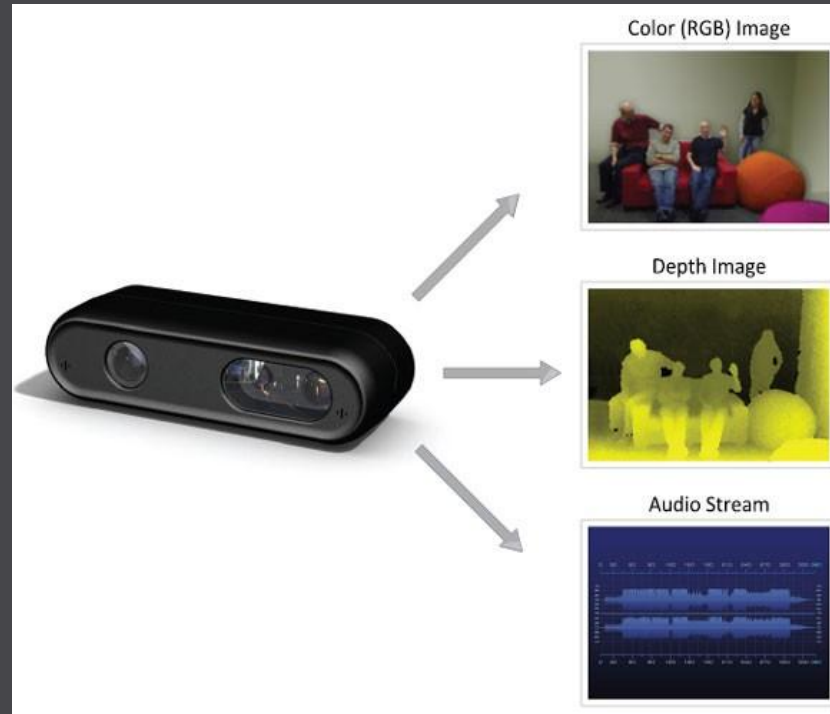
- Camera CMOS



Kinect - Architettura



Kinect – Come Funziona



Kinect – Come Funziona



Kinect SDK



Kinect SDK

- Download (Versione 1.0 1 Febbraio 2012)

<http://www.microsoft.com/en-us/kinectforwindows/>

- SDK comprende:
 - Drivers, per utilizzo su PC con Windows 7
 - APIs e Documentazione tecnica
 - Sorgenti di Esempi (C# e C++)

Kinect SDK - Prerequisiti

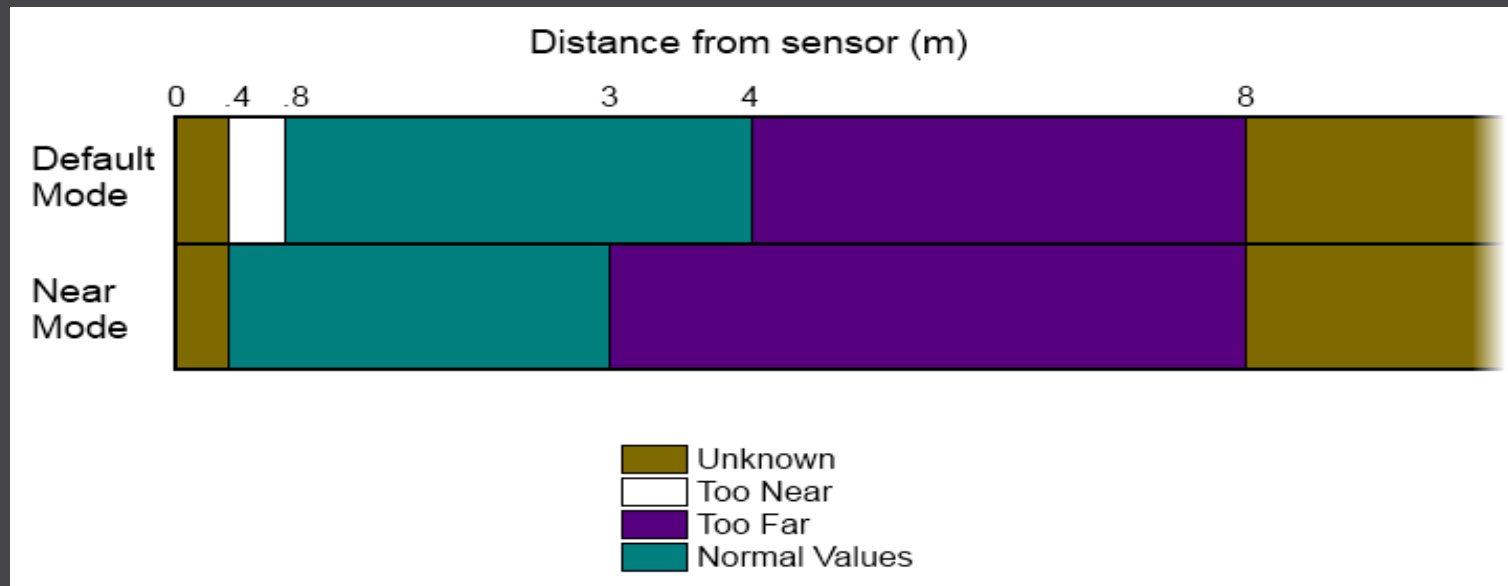
- HardWare

- Sensore Kinect for Windows
 - Sensore Kinect for Xbox 360 (+ **Alimentatore**) – SOLO per DEV !!!
- CPU DualCore 2.66 GHz o superiore
- Scheda Grafica con supporto DirectX® 9.0c
- 2-GB RAM (4-GB RAM raccomandata 😊)

- Software

- Windows 7 (x86 or x64)
- Visual Studio 2010 Express o superiore
- Microsoft .NET Framework 4.0

Differenze Kinect for WINDOWS vs Kinect for XBOX360

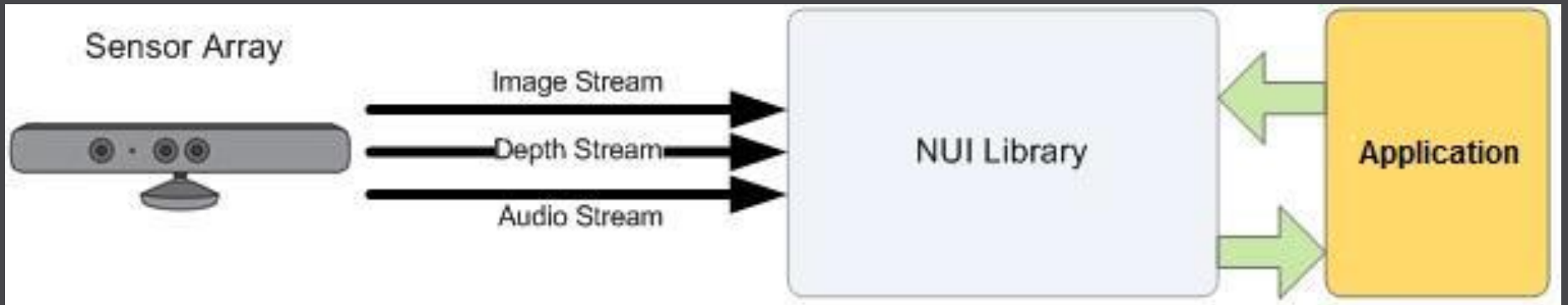


	Depth + player mask	Center hip joint	Other 19 joints
Default Mode	Yes	Yes	Yes
Near Mode	Yes	Yes	No, for v1.0

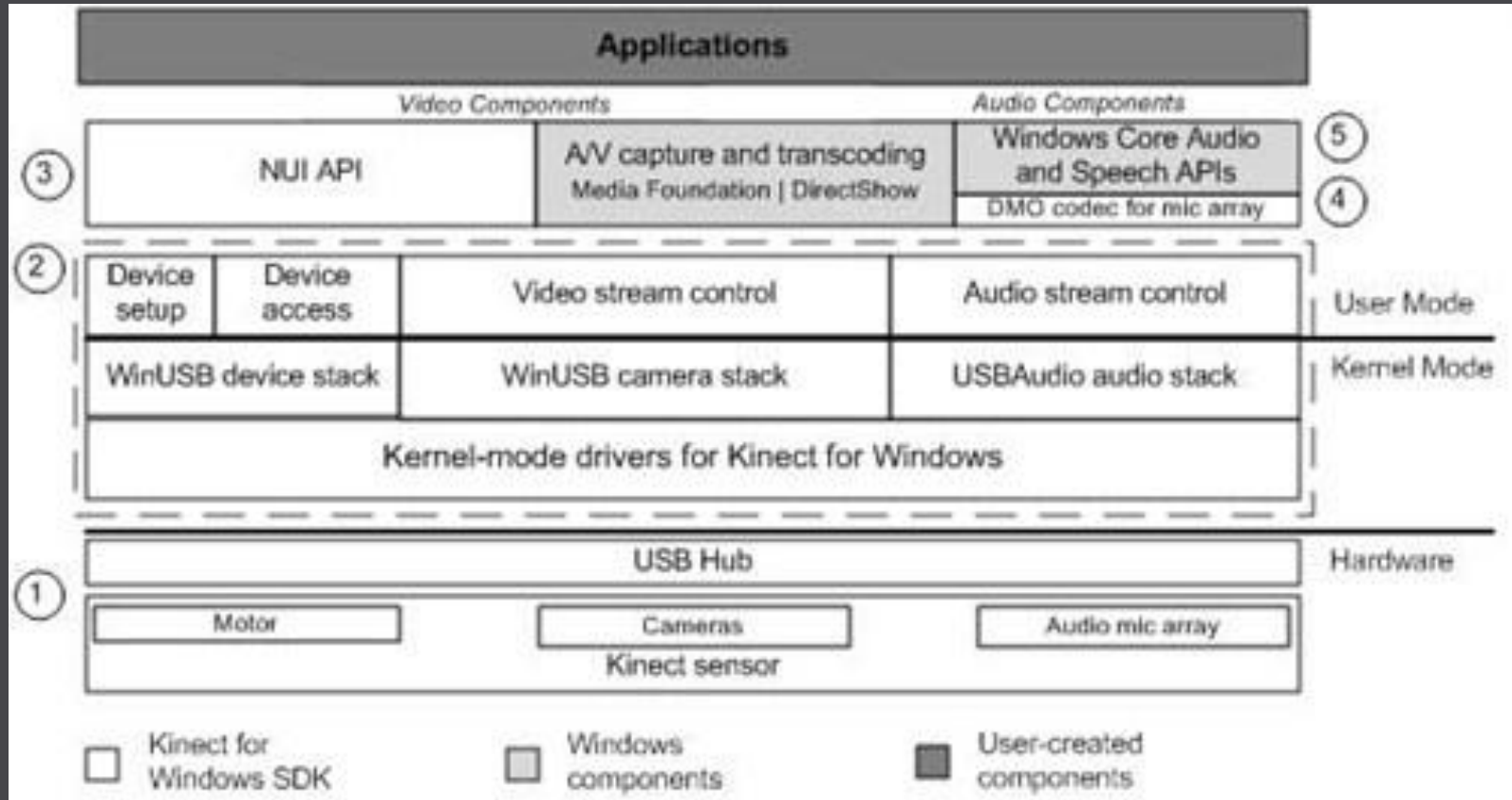
Differenze Kinect for WINDOWS vs Kinect for XBOX360



Kinect SDK – Architettura SW

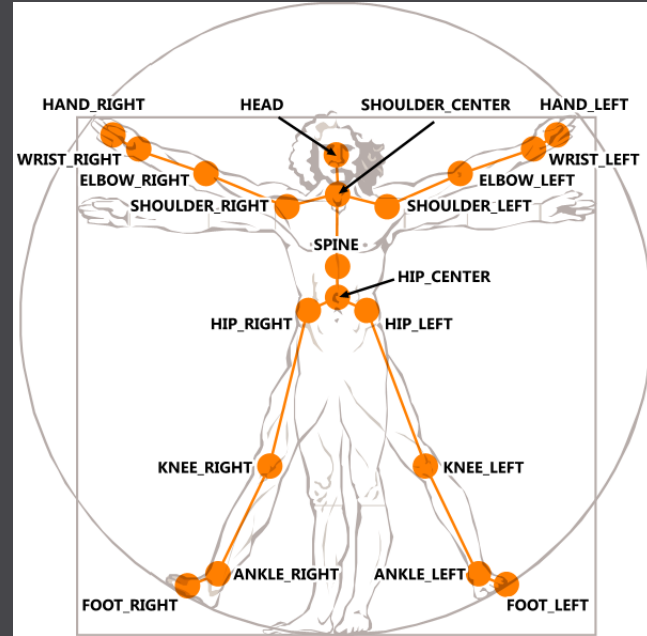
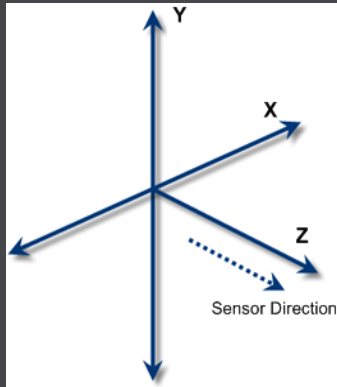


Kinect SDK – Architettura SW



Demo

Kinect SDK – Skeletal Tracking



Kinect SDK – Skeletal Tracking

- Massimo due 'giocatori' in contemporanea
- Per ogni 'giocatore' viene gestito un set di punti (Joint) $\langle x, y, z \rangle$
- Ogni punto ha un stato
 - Tracked, Not tracked, or Inferred
 - Inferred = Nascosto, Tagliato o non sicuro
 - Not Tracked – NON Identificato ricordarsi di gestirlo nel codice

Kinect SDK – Skeletal Tracking

```
Private Sub SkeletonFrameReadyHandler(sender As Object, e As SkeletonFrameReadyEventArgs)
    Dim firstSkeleton = (From s In e.SkeletonFrame.Skeletons
        Where s.TrackingState = SkeletonTrackingState.Tracked
        Select s).FirstOrDefault()

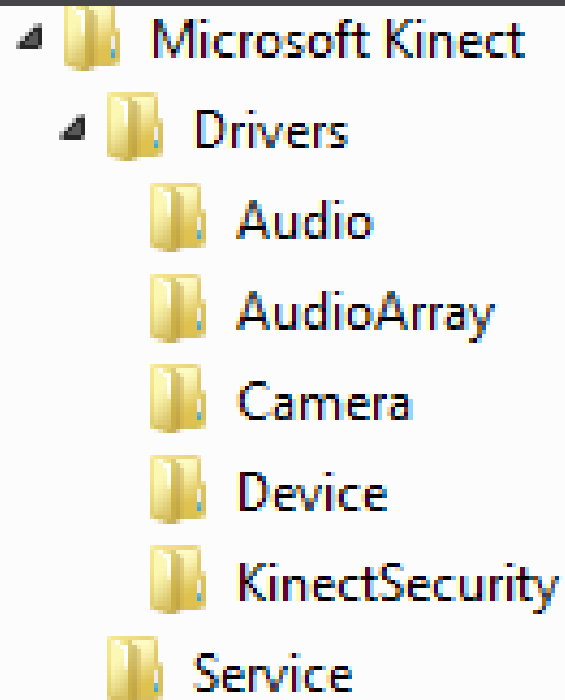
    If firstSkeleton IsNot Nothing Then
        Dim handRightJoint = firstSkeleton.Joints(JointID.HandRight)
        Dim handRightPosition = handRightJoint.Position

        Dim handLeftJoint = firstSkeleton.Joints(JointID.HandLeft)
        Dim handLeftPosition = handLeftJoint.Position

        If Calculate2DDistance(handRightPosition, handLeftPosition) < 0.05 Then
            ' posso considerare le mani vicine
        End If
    End If
End Sub

Private Function Calculate2DDistance(a As Vector, b As Vector) As Double
    Dim dx = Math.Pow(a.X - b.X, 2)
    Dim dy = Math.Pow(a.Y - b.Y, 2)
    Dim distance = Math.Sqrt(dx + dy)
    Return distance
End Function
```

Kinect for Windows RunTime



Coding4Fun Kinect Toolkit

Current Coding4Fun Kinect Toolkit:

WPF:

Depth Data Extension Methods:

- » `ImageFrame.ToBitmapSource()`
 - » returns `BitmapSource`
- » `int[].ToBitmapSource()`
 - » returns `BitmapSource`
- » `int[].ToBitmapSource(int width, int height, int minimumDistance, Color highlightColor)`
 - » returns `BitmapSource`
- » `ImageFrame.ToDepthArray()`
 - » returns `int[]`
- » `int[].GetMidpoint(int startX, int startY, int endX, int endY, int minimumDistance)`
 - » returns `Point`
- » `BitmapSource.Save(string fileName, ImageFormat format)`
 - » returns nothing

Skeleton Data Extension Methods:

- » `Joint.ScaleTo(int width, int height)`
 - » Scales a Joint's Position to the maximum width and height specified
- » `Joint.ScaleTo(int width, int height, float maxSkeletonX, float maxSkeletonY)`
 - » Scales a Joint's Position to the maximum width and height specified

Controls:

- » Hover Button

WinForm:

Depth Data Extension Methods:

- » `ImageFrame.ToBitmap()`
 - » returns `Bitmap`
- » `int[].ToBitmap()`
 - » returns `Bitmap`
- » `int[].ToBitmap(int width, int height, int minimumDistance, Color highlightColor)`
 - » returns `Bitmap`
- » `ImageFrame.ToDepthArray()`
 - » returns `int[]`
- » `int[].GetMidpoint(int startX, int startY, int endX, int endY, int minimumDistance)`
 - » returns `Point`
- » `Bitmap.Save(string fileName, ImageFormat format)`
 - » returns nothing

Skeleton Data Extension Methods:

- » `Joint.ScaleTo(int width, int height)`
 - » Scales a Joint's Position to the maximum width and height specified
- » `Joint.ScaleTo(int width, int height, float maxSkeletonX, float maxSkeletonY)`
 - » Scales a Joint's Position to the maximum width and height specified

<http://c4fkinect.codeplex.com/>

Demo

Q&A

- Materiale su

<http://www.communitydays.it/>