

# Term Project

# VTK C#

- ActiViz .NET
  - <http://www.kitware.com/opensource/avdownload.php>
  - a tool for generating C# wrappers around VTK, an advanced, open-source software system for visualization.
  - [ActiViz .NET 5.2 Users Guide.pdf](#)
- **NuGet** (可直接用LIB)
  - a Visual Studio extension that makes it easy to install and update third-party libraries and tools in Visual Studio
  - <http://nuget.org/packages?q=VTK>
    - [Kitware Activiz.NET \(x64\)](#)
    - [Kitware Activiz.NET \(x86\)](#)
    - [ActiViz .NET 5.2 Users Guide.pdf](#)
  - **OpenCV**
    - [OpenCV](#)
    - [OpenCV headers](#)
    - [OpenCV\\_generic\\_binaries](#)

# ITK 4.2

- <http://www.itk.org/ITK/resources/software.html>
- **MICCAI 2011 Tutorial**
  - <http://midas.kitware.com/community/view/65>
  - ITKv4TheNextGenerationTutorial.pdf
- **DICOM: GDCM 2.0**
- **Refactored Level Sets**
  - Easy to add new terms.
  - N Level-Sets function evolving at the same time
- **Refactored Registration Framework**
  - Composite transformations
  - Multi-threaded update functions
- **GPU**
  - [AnisotropicDiffusionImageFilter](#)
  - [GPUDemonsRegistrationFilter](#) implements the demons deformable algorithm that register two images by computing the deformation field which will map a moving image onto a fixed image.

# SimpleITK

- <http://sourceforge.net/projects/simpleitk/files/SimpleITK/0.5.1/>
  - Python, Java, **Csharp**
- **Tutorial**
  - <http://midas.kitware.com/collection/view/175>
  - [ActiViz .NET 5.2 Users Guide.pdf](#)
- Use **ITK** from SimpleITK
- Use **OpenCV** from SimpleITK

# Topic Scope

- **Segmentation**  
(例:將腫瘤(或具有意義的器官或組織)切割出來,類似作業一)
- **Boundary detection**  
(例:找出超音波影像中的肋骨邊界或皮膚邊界,將不同組織區分開來)
- **Texture analysis**  
(例:以分析texture的方式找出特定組織或區別不同組織)
- **Registration**  
(例:做3D影像(一連串的2D slice)中slice和slice間的套合,達到自動追蹤特定區域的輪廓)  
(例:不同造影儀器對同一器官產生出的影像再利用套合對齊,such as MRI and ultrasound)
- **Visualization**  
(例:以一連串的2D slice建成可根據不同方向,角度觀察的3D structure)
- **Quantification**  
(例:量化某器官的體積及形狀像是血管的分枝數,曲率,半徑(可能需要先切割出該區域))
- 其他(例:MRI注入顯影劑後的變化...)

\*選取題目時需注意,該題目需要有醫學上的意義或做為其他應用之前處理

# Available image database

- <http://www.na-mic.org/Wiki/index.php/Downloads>  
(Organ: Brain, Prostate, Spine...)  
(Modality: MRI, CT...)
  - BITE: Brain Images of Tumors for Evaluation database  
<http://www.bic.mni.mcgill.ca/Services/ServicesBITE>
  - DDSM: Digital Database for Screening Mammography  
<http://marathon.csee.usf.edu/Mammography/Database.html>
  - 可尋找其他online的public/free的image database
  - 把paper上的範例圖擷取下來
- \*project報告中需註明影像來源及指明那些影像用來產生結果與數據

# Toolkit & journals

- Toolkit

<http://www.na-mic.org/Wiki/index.php/Downloads>

Slicer, NA-MIC Kit

\*做為前述library, toolkit的補充

- Journal

Radiology

IEEE Transactions on Medical Imaging

Medical Physics

Ultrasound in Medicine and Biology

\*其餘期刊亦可,以年代較近的為優先,不可implement我們Lab的paper

# Examples

## NA-MIC

- [http://www.na-mic.org/Wiki/index.php/2009\\_Summer\\_Project\\_Week](http://www.na-mic.org/Wiki/index.php/2009_Summer_Project_Week)
- [http://www.na-mic.org/Wiki/index.php/2010\\_Summer\\_Project\\_Week](http://www.na-mic.org/Wiki/index.php/2010_Summer_Project_Week)
- [http://www.na-mic.org/Wiki/index.php/2011\\_Summer\\_Project\\_Week](http://www.na-mic.org/Wiki/index.php/2011_Summer_Project_Week)
- [http://www.na-mic.org/Wiki/index.php/2012\\_Summer\\_Project\\_Week](http://www.na-mic.org/Wiki/index.php/2012_Summer_Project_Week)

- EX

## MR to Ultrasound Registration Methodology

[http://www.na-mic.org/Wiki/index.php/2010\\_Summer\\_Project\\_Week\\_MR\\_to\\_Ultrasound\\_Registration\\_Methodology](http://www.na-mic.org/Wiki/index.php/2010_Summer_Project_Week_MR_to_Ultrasound_Registration_Methodology)