Automated Image Analysis

Options for Implementation

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Options for implementation

- What are the options
- Collaborative development
  - Four different models
- Open source software
- 'Sharing' model
- Medical Devices Regulations

What are the options?

- Commercial Software
  - Scanner specific vendor QA software
  - Off the shelf third party QA software
    - Eg AutoQA Lite ~ US$2500
    - See http://www.ctug.org.uk/meet04-01-13/reilly.html
- Open source/free existing software
  - Osiris, Osirix, Sante DICOM Viewer, ImageJ
- In house software
  - MATLAB, IDL
- Collaboratively written or distributed software

Model 1: Limited distribution

- Existing in house software
- Organise distribution through CTUG
- Distribution on a no-support, no-liability basis

Limited distribution: Pros

- Similar to what is already happening
  - but currently on a small scale
- Instant implementation
  - only setup time would be collection and distribution of code

Limited distribution: Cons

- Reliant on a few developers
- Developers get nothing back for their efforts
  - (except support calls and grief!)
- New features are unlikely to be coded quickly
  - unless of interest to the developer concerned

Model 2: IDL/MATLAB

- Use commercial development environment, i.e. IDL or MATLAB
- Share code between IDL or MATLAB developers
- Distribute runtime versions for non IDL or MATLAB developers

IDL / MATLAB: Pros

- Existing code base
- Get started immediately
- Familiar development environment and language
- Powerful array processing and image processing tools

IDL / MATLAB: Cons

- Cost
  - Ongoing cost of IDL/MATLAB licenses
    - E.g. IDL ~£500 to £1000 per license per annum
    - Potentially would be paid for anyway?
  - Cost to end user
    - (IDL if DICOM module used – probably not needed)
  - Additional cost to developer
    - (MATLAB to buy runtime compiler ~$100 to $1000)

IDL / MATLAB: Cons

- 2 parallel code bases
  - Even with collaboration everything would be done twice
- Lots of redundant code
  - Massive effort required to unify the best bits

    or
  - All but one is abandoned ☹
- Interface programming relatively difficult

Model 3: From scratch

- Start the effort from scratch
- Use programming language within an open source development environment,
  - i.e. c, c++, c#, java, python
- Collaborate on the project with other NHS physicists and others

From scratch: Pros

- Free development environment
  - Zero cost to developers departments
- Binary versions of code
  - Zero cost to end users
- Many libraries available
  - both for DICOM and for mathematical functions
- Single code base for all to collaborate on

From scratch: Cons

- Current code
  - Possible none will be reusable
- All developers forced to learn a common language
  - although some languages can 'wrap' others
- Initial Development time
  - Experience shows that starting from scratch takes years of work to get a usable product

Model 4: Plugin/Extend

- Use an open source existing project as a base
  - Example ImageJ

Plugin / Extend: Pros

- Existing featured product, already in use
- Other groups around the world have extended it for medical applications
- Can concentrate on adding features needed by our community
- Plus all the Pros for model 2 also apply!

Plugin / Extend: Cons

- Current code
  - Still would have to abandon most current code
- All developers would have to use the appropriate language
  - Java (for plugins) or Java Script (for macros) in the case of ImageJ

Collaboration summary

	Cost	Learning curve	Initial development time	Interface and file I/O dev. time	New feature development time
Limited distribution	☹	☺	☺	☹	☹
IDL / Matlab	☹	☺	☺	☹	😐
From scratch	☺	😐	☹	😐	☺
Plugin / Extend	☺	😐	😐/☺	☺	☺

Open source –what's that?

- The code is made available to anyone
- Anyone can edit the code to improve it
- Anyone can redistribute it

- It doesn't mean you can't sell it
- It does mean that you can't stop somebody else selling it!

Open source worries

- Will anyone in the world be able to use my
  code without asking me?

  Yes
- Will I be held responsible for errors in my code?

  No
- Will people I don't know be able to introduce errors into my code?

  No

Open source benefits

Open source promotes software reliability and quality by supporting independent peer review and rapid evolution of source code.

‘Sharing’ model

1. Distribute between developers and users on request
2. Host code on CTUG website for easy download (registration required?)
3. Host code on open source repository website (eg sourceforge.net)

Medical Device Regulations

- Would this software be caught by the regs

Probably not!

  - Has it been placed on the market?
    - Free vs. for payment – not relevant
    - transfer between Health Care Establishments
  - Is it a medical device?
    - Key term is that it is intended to be used on **human beings**
- But…
  - Would probably have to have robust QA

Source: P Cosgriff (www.nuclearmedicine.org.uk Medical Software QA page)

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