ACADEMIC SOFTWARE IN CANCER RESEARCH: USER’S PERSPECTIVE

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“PROPRIETARY – Varian Medical Systems”
Devices presented may not be available in all markets.

**Intended Use Summary**
Velocity is a stand-alone software product that provides the physician a means for comparison of medical imaging data from multiple DICOM conformant imaging modality sources. It allows the display, annotating, volume rendering, registration and fusing of medical images as an aid during use by diagnostic radiology, oncology, radiation therapy planning and other medical specialties. Velocity is not intended for mammography diagnosis.

**Safety**
Radiation treatments may cause side effects that can vary depending on the part of the body being treated. The most frequent ones are typically temporary and may include, but are not limited to, irritation to the respiratory, digestive, urinary or reproductive systems, fatigue, nausea, skin irritation, and hair loss. In some patients, they can be severe. Treatment sessions may vary in complexity and time. Radiation treatment is not appropriate for all cancers.
Think BIG
We come together to change the world one megabyte at a time, and we can only do it together with our private partners from the corporate community.

CI4CC Thinks BIG
Start small
Two Problems We Encountered

Helping clinical care teams treat patients

Helping care teams conduct clinical research

Two problems may require two different solutions!
Image-Guided Cancer Therapy
Lifetime of follow-up imaging
VIP Algorithms

\[
NMI(R,T) = \frac{H(R) + H(T)}{2H(R,T)}
\]

\[
H(T) = -\sum_{k=1}^{N} p_{T}(k) \log p_{T}(k)
\]

\[
H(R) = -\sum_{j=1}^{N} p_{R}(j) \log p_{R}(j)
\]

\[
I(R,T) = -\sum_{j=1}^{N} \sum_{k=1}^{N} p_{R}(j) p_{T}(k) \log p_{R}(j) \log p_{T}(k)
\]

Deformable image registration
FDA cleared in 2008

Unaligned images

Aligned images

Our Vision: Images are data not pictures!
Expanded capabilities

- Deformable voxel tracking,
- Segmentation, annotation and markup
- RECIST/WHO and other analytics
- Plug-in architecture for automated research engines
- Integration with commercial components
Spine Radiosurgery Case
Bring data together

Did the therapy work?
Good Response

Increased activity

No Change

SUV Map

Volume Map

Quantitative Image Analytics
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Search Prior Knowledge
Enable clinicians to use previous patients’ experiences in the health care system to guide future care.

Care Team Collaboration
Facilitate a coordinated cancer care workforce & mechanisms for easily sharing information.

Cancer Research
Improve the evidence base for quality cancer care by utilizing all of the data captured during real-world clinical encounters.

Delivering High-Quality Cancer Care:
Charting a New Course for System in Crisis
Clinical trials incorporating advanced imaging
Research Software

- MeVisLab
  - Rapid prototyping
- VolView
  - Visualize images
- ParaView
  - Visualize meshes
- itk
  - Repository of image processing algorithms
- VTK
  - Repository of visualization algorithms
- CMake
  - Multi-platform build system
Prototyping
Example of simple pipeline to smooth a CBCT dataset
Velocity Clinical Trial Analysis (CTA) Tools

• Velocity Clinical Trial Analysis (VelocityCTA) was developed and deployed for integration with NCI informatics services to provide visualization/annotation/markup of multi-modality imaging and DICOM RT objects in image-guided radiation therapy clinical trials.
• Developed as part of ARRA High Tech Grant
Voxel clustering for quantifying PET-based treatment response assessment

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Results: The algorithm was retrospectively applied to PET/CT and radiotherapy (RT) oncology data from an NCI-sponsored clinical trial (81 clinical cases from RTOG 0522 Trial) for combined drug and radiation therapy in head and neck carcinomas. This clinical trial dataset presented a realistic environment for implementing and validating our algorithm to correlate local response as observed in serial PET with delivered dose. The technique was instrumental in detecting geographical and

Pre-Treatment Scan  Post-Treatment Scan  Difference
Uniting Cancer Research

VARIAN DEVELOPER WORKSHOP
for Researchers

Learn how to leverage non-clinical Varian Research Tools in your projects during our 2-day hands-on workshop for customer developers.

Topics will include:

- TrueBeam® System DeveloperMode
- Eclipse™ Treatment Planning System APIs
- Monte Carlo solutions
- Use of open-source tools for the RT community, and more
Academic Industry Partnership (AIP) is important for both patient care and research.