



Segasist Technologies

Discussion Paper: Segasist™ End User Research Study



Introduction

In 2009, Segasist Technologies Inc. undertook a proprietary investigation to understand how segmentation software like Segasist™ Segmentation Assistant would provide value for clinical users and procurers of advanced visualization tools. In addition, Segasist was looking for validation that current development goals for our Segasist software were on target. We submit that the customer insights shared in this discussion paper are not new; rather they reiterate the importance we place on listening to the customer.

The results of this investigation validate a number of Segasist Technologies' assumptions regarding the need for accurate auto-segmentation and volumetric analysis productivity tools in the clinical setting. This paper is intended to highlight the real-world concerns expressed by respondents and showcases the features and benefits of Segasist software that currently meet user needs.

About The Segasist End User Research Study

The qualitative research consisted of primary interviews and questionnaires with volunteers across Canada, the United States and the UK. Respondents were accepted based on number of years of experience and to provide a cross section of opinions by facility type including;

- Research facilities
- Imaging centers
- Community hospitals
- Teaching/Large regional hospitals
- Teaching/Small regional hospitals

Varying points of view were solicited to build an accurate assessment of technology from front-line users as well as business needs assessors. Respondent roles within the facilities, therefore, spanned the following occupations:

- Radiation Oncologists
- Radiologists
- Medical Radiation Technologists
- Medical Radiation Therapists/Dosimetrists
- Engineers
- IT / PACS Admin / Department Managers
- Medical Physicists
- CIO / CTO.

A Note on the Study

This study is proprietary and confidential, as are the responses given by our generous participants. The terms of the study dictate that Segasist Technologies is unable to share exact data regarding participant numbers, locations, and roles lest this information compromise the anonymity of our contributors. We



recognize this information is critical to ascertain the validity of this information and, therefore, we suggest the reader views this information as directional, rather than statistical. Segasist Technologies has benefited greatly from the anecdotal information shared by respondents and our intent, with this paper, is to share some of that information with readers.

Should you wish to further discuss the data or the study with Segasist Technologies, we would be happy to do so, on a case-by-case basis. Please contact Hamid R. Tizhoosh, (647) 260-7834.

The Clinical Perspective

Improved Technology and Complex Protocols

All clinical respondents, regardless of facility type and specialty, reported radiology departments with at least one 64-slice CT scanner. Some had 320 slice scanners (producing on average 10,000 images per case). In research facilities, the amount of imaging data produced for review and report increases exponentially.

The increasingly complex and data rich healthcare and research environments provide opportunity to mine more sophisticated information. In particular, Radiologists, Radiation Oncologists and Therapists were interested in better delineation of healthy and unhealthy tissue in 3D. Further, more precise estimates of volume afforded by a more accurate, consistent automated tool were perceived as potential benefits to oncology treatment planning in two ways: they would allow “the lowest possible dose distribution” and reduce clinical case turnaround times.

Clinical respondents’ feedback on existing automation tools indicated:

1. current “automated” solutions fall clearly short of the mark, and
2. “one-click” auto-segmentation was desired.

Though the vast majority of clinicians surveyed expressed these opinions, there was less emphasis on a “one-click” solution for oncology treatment planning. The interplay between the Radiation Oncologist, Radiation Therapist and Medical Physicist is very structured and treatment plans require sign-off by all three professionals. This structured workflow places an emphasis on the delivery of accurate dosage and, therefore, these particular clinicians would prefer a final “manual” review of auto-contoured images prior to creating treatment plans.

Addressing the Shortfall

Segasist Segmentation Assistant software was designed to address many of the shortfalls inherent in current auto-segmentation tools. The software integrates user feedback to dynamically adjust image-

“3D would be great to check sculpting contours and edges between diseased and healthy tissue. Right now the current functionality is useless.”



contouring parameters and converging toward the expert-level perception over time. This simple but powerful idea enables Segasist to overcome many of the usage and deployment barriers common to existing auto-contouring software: static parameter configuration, failure to store and recall manual corrections by expert users, and inability to perceive differences in object boundaries or healthy/unhealthy tissue as well as the expert user.

“True” Automation

All respondents were interested in a greater degree of software automation commensurate with the clinician’s manual skill. And indeed, many preferred a “one-click” solution. Segasist software is an assistive learning tool intended to aid the clinical user with segmentation using skills “learned” during training and use. The Segasist system accumulates data on an expert user’s contouring preferences and stores the data for future use. A user’s contouring preferences include “how to” information, assisting Segasist in contouring based on modality and body part/lesion.

The user’s editing preferences are stored in a user profile and applied to future segmentation, gaining accuracy and consistency with use and specific application. In theory, a “fully-trained” installation of Segasist software would approach a “one-click” solution over time.

Minimizing Dosage

Respondents involved in cancer treatment planning reported the need to review contoured images as part of a mandate to “strive for the least dose possible”. Of particular importance in affecting dosage is the need to accurately calculate volumes from 2D (and/or 3D) images.

In treatment planning, Segasist could provide more accurate volumetric data to inform dosage. Segasist provides more accurate volumetric measurement (from 2D and 3D) of organs, glands and tumors than any current competitive method. In particular, Segasist is especially effective for more challenging image types and body parts such as head and neck, brain, lung and liver.

Time-Savings and Throughput

Clinical respondents identified that – depending on case and modality – review of images can take from 15 minutes to a week. The time consumed was directly attributed to the limitations and inefficiencies of current contouring and auto-contouring tools and is a source of frustration. There is healthy distrust of current solutions. In fact, one respondent commented, “the reality is that [current auto-contouring tool] requires more manual intervention than if you did the treatment plan by hand from scratch”.

“If I could do my job faster and more accurately, get it to the dosimetrist faster, or if the dosimetrist could get the contoured case to me faster, that would be a great improvement over what we have now. Our process is time consuming, but the tools we use need not be.”



In contrast to other solutions, Segasist has the potential to reduce time-per-case and, therefore, increase throughput. During training and use, Segasist stores user-editing preferences in a user profile and applies these preferences to future segmentations of images taken from the same modality or lesion/body part. Over time as the expert uses Segasist (during initial or continuous training mode), less time is required to segment and correct results, affecting time-to-treatment and throughput.

Consistency & Accuracy

All clinicians expressed a need for greater accuracy in segmentation tools. A proportion emphasized the need for consistency, particularly for recognition of the same or similar disease features, or body parts. To further complicate the need for accuracy and consistency is the reality of increased patient throughput and images (from multi-slice scanners). Radiation Technologists in particular noted a shift in role definition from modality specialist to generalist, reflecting the necessity for all advanced imaging modality technologists to be proficient in preparing and processing advanced visualization cases, regardless of complexity. This necessity, however, increases the potential for inter-observer variability.

Segasist overcomes any current upper bound on accuracy, raising the bar for unedited volumetric analysis solutions. It does this by learning how to guide the auto-segmentation in order to reach higher agreement with the expert user's manually segmented images (as "learned" in initial training and during real-time, interactive training).

Through use and "training", Segasist can improve decision-making capabilities by offering more accurate contouring. Once many user preferences have been collected, they can be used to configure a "best-practice" rule set, which Segasist can then apply to subsequent segmentation tasks. That is, Segasist can be configured to display modality and anatomy-based preferences – warning the user about non-standard edits and assisting with best-practices observance. This capability could help reduce inter-observer variability.

The Business Perspective

Footprint & Complexity

Clinicians expressed the need for tools that would automate their contouring workflow more effectively. However, there were concerns expressed regarding footprint. Each of the facilities in this survey had 2-5 3D/AV workstations within their departments, meaning space is generally at a premium. This supports the C-Level/IT respondents' perspective that managing more hardware is not an option, particularly as footprint reduction is an emerging trend in healthcare IT.

Clinicians reported that given the current patient workloads in radiology and particularly in radiation oncology, multiple systems in an already taxed patient and clinical workflow would not be tolerated. Embedded systems (into PACS or the 3D/AV software) were the preferred method of deployment for new tools to reduce complexity and footprint. It was preferred that these systems be transparent and easy to use.



The Segasist software was created by Segasist Technologies to be compatible with all existing Patient Archiving and Communications Systems (PACS), providing seamless workflow integration and connectivity with digital imaging communications equipment. In addition, Segasist is a flexible solution; it can be applied to a multitude of medical image types, integrated into existing commercial visualization and planning software, or used as a plug-in productivity tool in a clinical setting.

“A solid technology roadmap is of utmost importance... we are not going to align ourselves with vendors who are not in touch with changing market conditions.”

Enabling Healthcare

C-Level respondents promoted the idea that technology must enable healthcare. That is, it must have a firm healthcare and business use. Of particular interest was the “technology roadmap” indicating a customer climate that is primarily interested in a technology vendor who anticipates new delivery models (i.e., thin client) and increasingly sophisticated imaging requirements (i.e., 3D and multi-slice).

Segasist Segmentation Assistant software can be integrated into existing planning software or used as a plug-in volumetric measurement tool. It is currently thought to be feasible for use in radiation therapy planning and radiology. However, the development team is exploring extending the product across modalities (Brain MR, Prostate MR, Thyroid US, Prostate US, Head & Neck CT, Liver CT, etc, as well as X-Ray and PET). The intent is to provide a volumetric analysis productivity tool that is ubiquitous across departments and clinical functions to support delivery as well as streamlining technology requirements and costs.

Segasist Technologies follows a rigorous development process, facilitating regulatory compliance, adherence to common standards and OEM integration. The development process includes a stringent document and source code control system, state-of-the-art development tools, and effective project management. The goal is to provide flexible, appropriate solutions for advanced visualization to enable healthcare treatment while meeting the stringent needs of healthcare business infrastructure.

Clinical Validation

Clinical validation is extremely important to clinical, business and technical respondents. Conversations with respondents reiterated the importance of engaging clinicians in the development and deployment of Segasist Segmentation Assistant. To that end, Segasist Technologies welcomes interest from clinical validation sites for its completed software and from vendors and clinical experts in other modalities and treatment areas to pursue feasibility studies. In addition, clinical advisory board openings need to be filled. Please review the contact information below to speak with Segasist Technologies regarding these opportunities.

As of September 2010, clinicians/oncologists from *London Health Sciences Centre* (London, Ontario) have started an extensive validation of Segasist PMR software (a contouring tool for prostate MR images). As well, experts from *Princess Margaret Hospital* (Toronto, Ontario) will support this validation by providing marked/contoured images.



Summary

When Segasist Technologies undertook this investigation, it was with the intent to better understand how to refine our software and meet the needs of potential customers.

Based on the feedback from this report – some of which we have shared here – we have refined our development to more accurately meet current clinical workflow needs and enable healthcare goals. We have also altered our “technology” roadmap to anticipate the future needs of healthcare technology.

About Segasist

Our premiere product - Segasist Segmentation Assistant software - is initially thought to be feasible for use in radiation planning and radiology. Products are currently in development for Prostate MR, Lung CT, and Prostate CT/Ultrasound. Segasist is a flexible solution that could also be applied to other modalities.

Segasist Technologies follows a rigorous development process, facilitating regulatory compliance and OEM integration. Our process includes a stringent document and source code control system, state-of-the-art development tools, and effective project management.

Call to Action

If you are interested in discussing Segasist Segmentation Assistant, the End User Research Study, or in participating in clinical validation or our clinical advisory board, please contact us. We look forward to speaking with you.

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