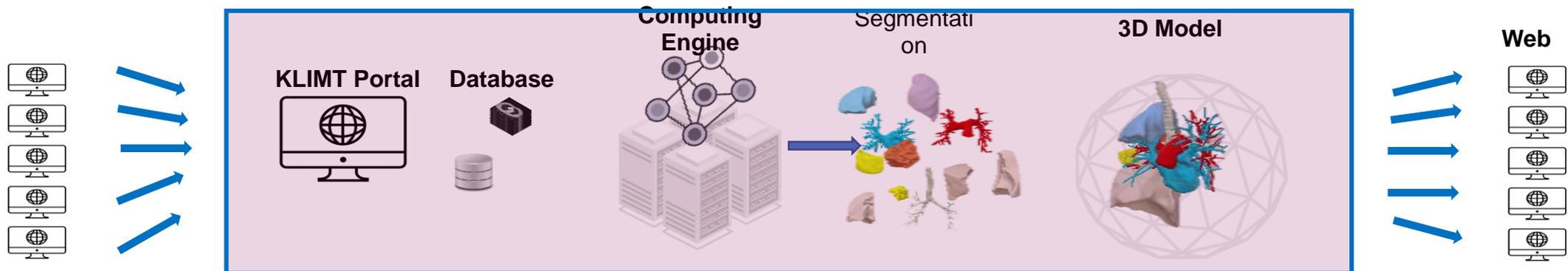


# 2024 대한심장혈관흉부외과학회 제56차 추계학술대회

2024. 10. 31 (Thu) - 11. 01 (Fri) 여수 엑스포 컨벤션센터



## Development of AI based full automatic Computer Aided Lung cancer surgery system



- After the presentation of LCSG 0821 and JCOG 0820, the frequency of sublobar pulmonary resection has increased in early lung cancer.
- Due to unfamiliarity with sublobar anatomy, segmentectomy is considered a challenging procedure compared to lobectomy. In segmentectomy, a deep understanding of the segmental anatomical structure of the broncho-vascular bundle is necessary.
- Each segment has various variations, and rather than adhering to fixed rules, it is essential to comprehend the anatomical structure during surgery and perform the segmentectomy accordingly.
- Recently, some 3D reconstruction programs have been developed and are commercially available for this purpose, and they are being applied in surgeries. However, most of these are workstation-based programs that require high installation costs and allow only semi-automation for image reconstruction, which limits their use to a few institutions.
- This study aims to develop a new AI-based, online, fully automated 3D reconstruction system that allows more surgeons to apply it easily in surgery.



- The chest CT DICOM data of 234 early-stage lung cancer patients from our institution were used as training data.
- An automatic segmentation algorithm for the lobe, airway, abnormal lung lesion, solid mass, and GGO lesion was created using open-source automatic organ segmentation programs (Total Segmentor, Medseg).
- Since there is no open-source algorithm for PA (Pulmonary Artery) and PV (Pulmonary Vein) segmentation, we developed our own algorithm
- The custom algorithm development involved the following steps:
  1. **Step 1:** Generation of semi-auto segmentation files using Synapse Vincent.
  2. **Step 2:** Creation of ground truth image files by expert thoracic surgeons using the 3D Slicer program, based on correction of the segmentation data produced by Synapse Vincent.
  3. **Step 3:** Machine learning training using the ground truth data to generate the final algorithm.
- **UI & Viewer:** The system was built using the widely adopted 3D Slicer and an online 3D viewer.
- Simple 3 step for utilization



## Type of surgery

### Computer Aided VATS Segmentectomy using side monitor



### Computer Aided VATS Segmentectomy using PIP



### Robotic surgery using 3D imaging System (KLIMT) & TilePro



- From June 2024 to August 2024
- Male : Female : 8: 4
- 12 Lung cancer patients underwent CAD (Computer aided ) Lung cancer surgery
- Type of operation
- 5 cases Robot assisted anatomical lung resection  
(3 Segmentectomy , 2 lobectomy)
- 7 cases VATS lobectomy :  
(2 Single incision Segmentectomy, 2 Single incision segmentectomy)  
( 2 conventional VATS segmentectomy, 1 conventional VATS lobectomy)
- All operation was successfully performed without thoracotomy conversion

- We were able to successfully perform anatomical segmentectomy and lobectomy using our internally developed AI-based full automatic Computer-Aided Lung Cancer Surgery system.
- We believe that the web-based system we are developing will be more universally accessible and easier for many users to apply in surgery compared to workstation-based commercial programs that are available only to a limited number of users.
- Through continuous machine learning and in-depth research, it is necessary to develop a more stable system that can be applied in various fields.

## Pre-op



Surgical planning  
& discussion

## Intra-op



Video-Assisted  
Surgery

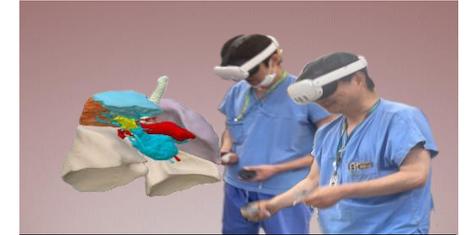


Robot-Assisted  
Surgery



Surgical  
Observation

## Post-op



Feedback  
& training