



**CALIFORNIA STATE SCIENCE FAIR  
2017 PROJECT SUMMARY**

<b>Name(s)</b> <b>Vinay Senthil</b>	<b>Project Number</b> <b>S0828</b>
<b>Project Title</b> <b>A Three Dimensional Modeling and Real Time Data Analysis Algorithm for Bronchoscopy Enhancement</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The objective of the project is to create a 3D computer model of the lung using simply the video feed from the tip of a bronchoscopy tool with minimal hardware modifications.</p> <p><b>Methods/Materials</b> Laptop with MATLAB R2016b. A yoga mat was rolled to form a dark tunnel that provided me with a simulated bronchial tube. Then, I attached a webcam and flashlight to one end of a long stick using the masking tape to act as the bronchoscopy tool. I connected the webcam to my laptop's USB port and used the image processing toolbox to process snapshots from the real time video feed and curve fitting toolbox for creating the splines for the model.</p> <p><b>Results</b> As the stick was pushed into the yoga mat tube, a 3D model is created by adding the ellipses the algorithm had calculated every second. The resulting model is hollow and also shows texture similar to the inside of the lungs. After each iteration, a new layer that is generated is added to the existing model in order to save time and memory rather than creating a whole new model from scratch. The tool is also able to pick up bends in the tube, indicating that lateral motion can be considered as the bronchoscope moves through the lung.</p> <p><b>Conclusions/Discussion</b> It is possible to create a 3D model of the lungs without exposing the patient and doctor to harmful radiation. Moreover, one does not need to follow the traditional methods of 3D reconstruction. It is possible to use only a video feed without a depth sensor to create a streamlined process that produces a 3D model in real time. Through this project, I have accomplished 3 goals: Image Conversion to 3D Model, Real Time Image Processing, and the generated 3D model shows what is ahead. This algorithm can be used by doctors as a tool to prevent repetitive bronchoscopies as well as for the future of robotic endoscopic surgeries in which computer vision software will be paramount.</p>	
<b>Summary Statement</b> I created an algorithm to process and analyze the video feed from the bronchoscopy tool to create a real time 3D model of the lung's airways without the need for radiation.	
<b>Help Received</b> None. I designed, coded, and implemented the algorithm and analyzed data myself.	