Dynamically Changing Computational 3-D Model of the Human Respiratory System driven by real-time Motion Capture data.

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Kinect for Windows v2 Developer Preview Program
Proposal Presentations

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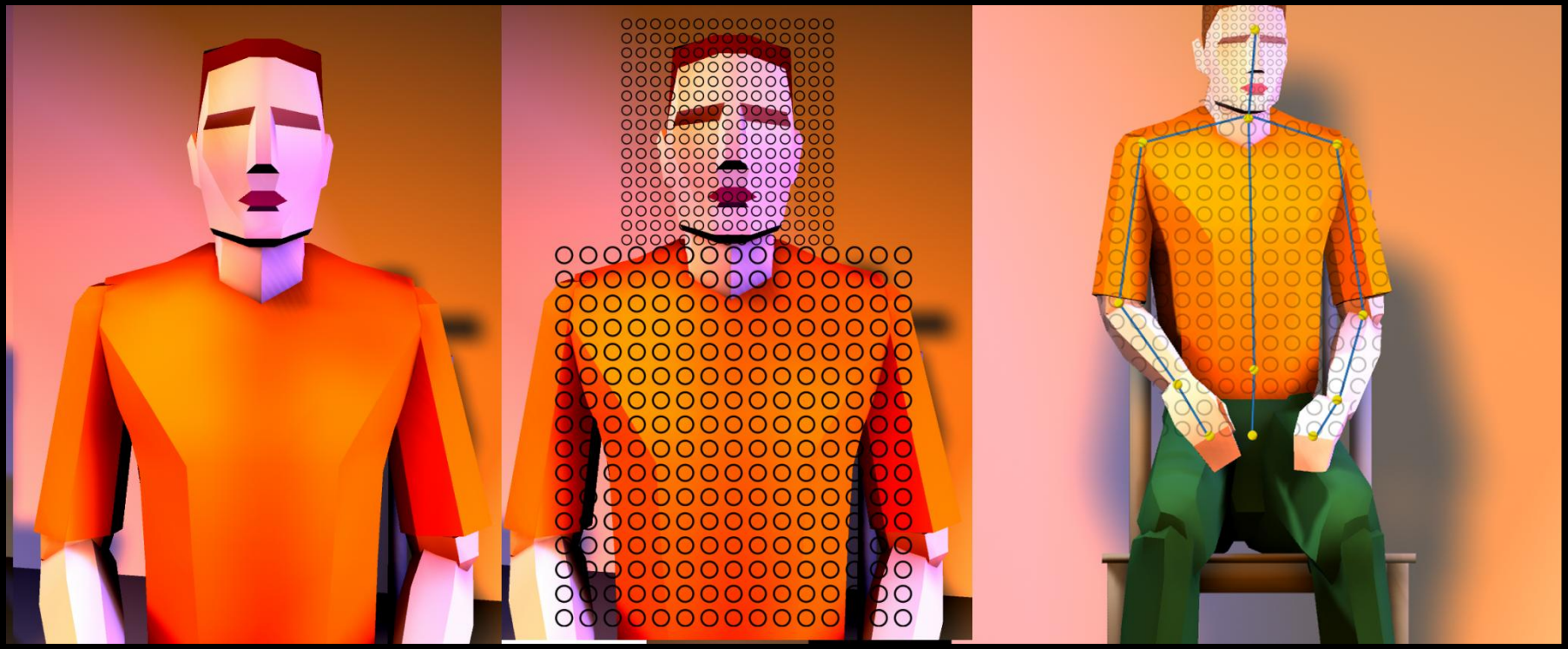
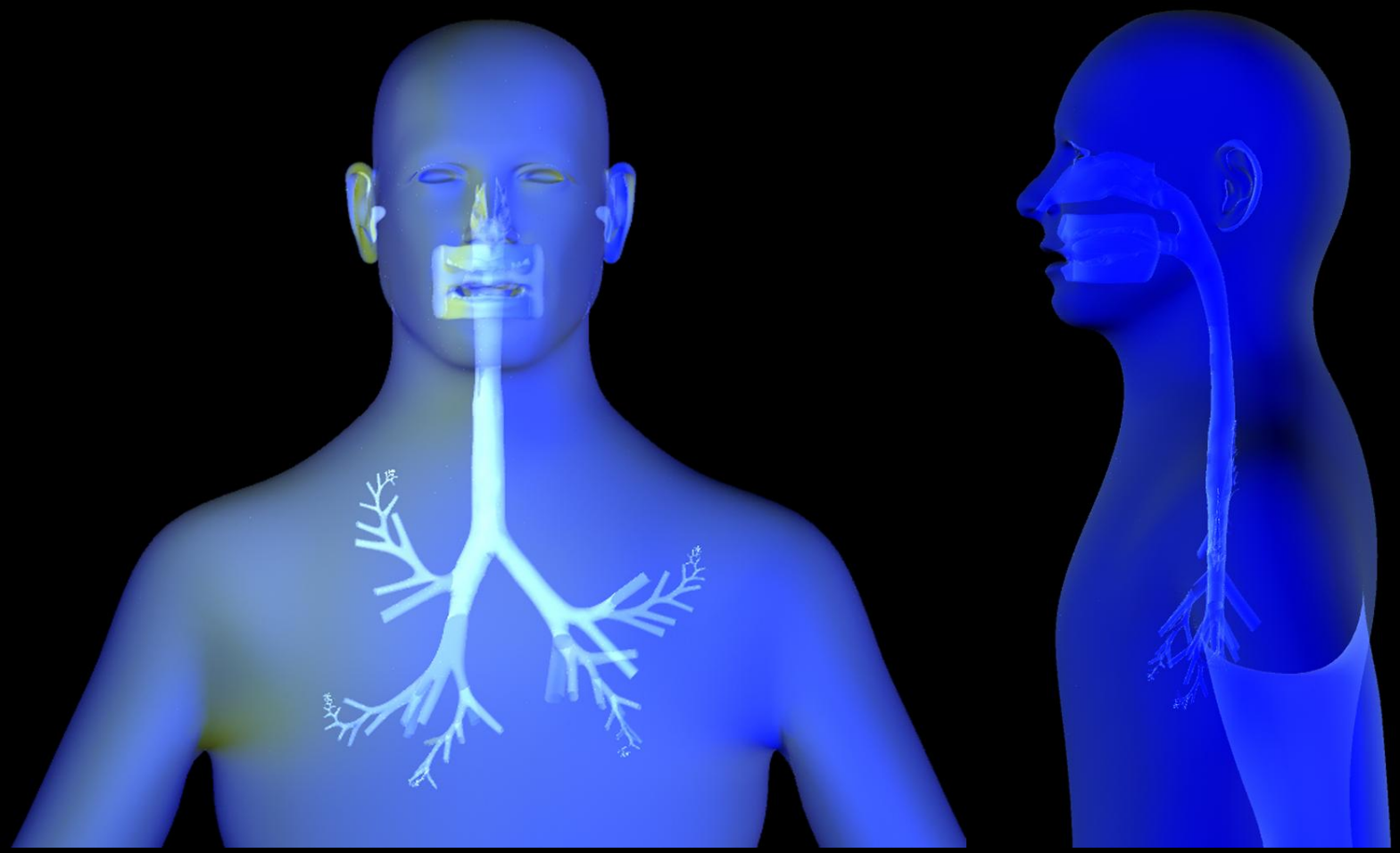
We propose to develop a Facial and Torso, Upper Body Motion Capture system. Once the motion of the face and torso are captured from individual subjects we propose to map this de-identified motion data to a predefined avatar which includes a morphologically-realistic computational model of the human respiratory system driven by motion capture data. This model with motion data then can be used to study the inhalation, deposition, and clearance of contaminants, while being adaptable for age, race, gender and health/disease status.

The process of electronically converting the movements of a person's face and upper body into a digital database using the Kinect for Windows scanners will allow motion capture data to drive a computational model of the human respiratory system . A database of motion capture data may then be used to adapt an avatar to be dynamically modified or vary by age, race, gender and health and disease status.

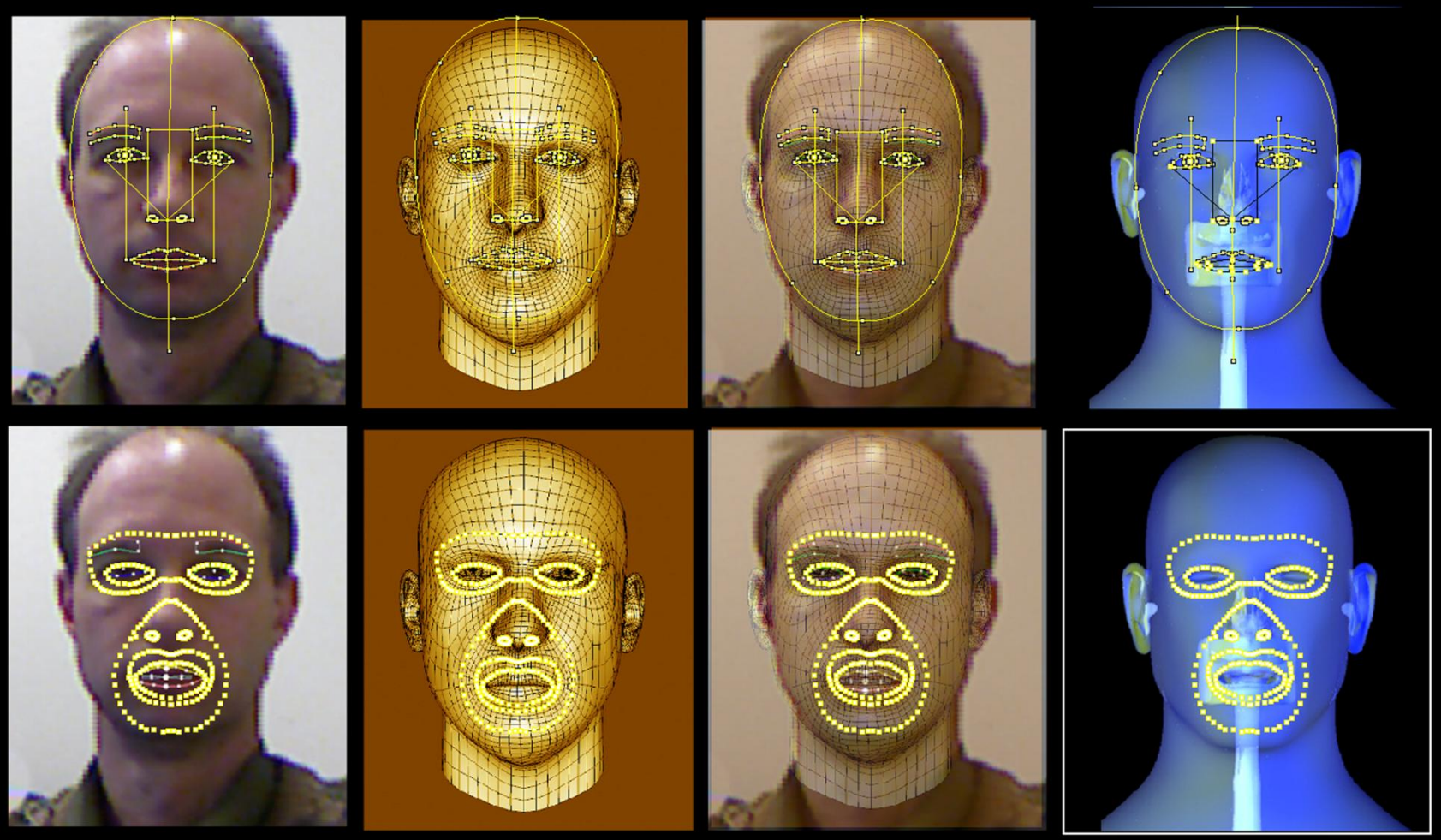


Step 1: Use the Kinect for Windows scanners to capture motion data for the face and upper body.

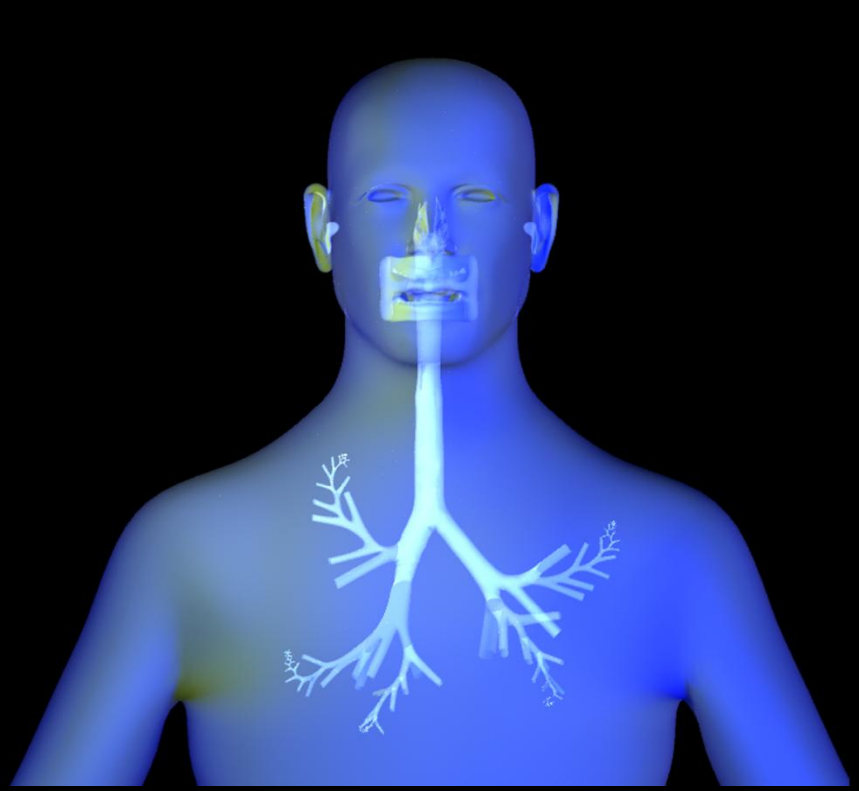


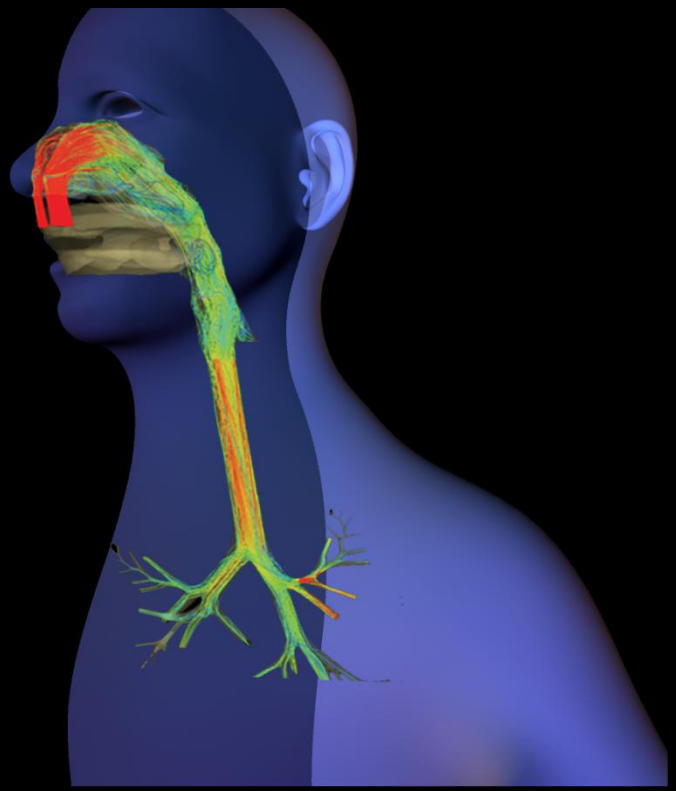
Our static human respiratory system model will be driven by the captured motion data provided by the Kinect for Windows.

EPA has already developed this morphologically-realistic computational model of the human respiratory system include the nasal, oral, pharyngeal, and laryngeal passages (extrathoracic region), the trachea and main bronchi (upper airways), the tracheobronchial tree, and branching networks through the alveolar region, allowing for nearly any variation of airway geometries and disease status to be studied.



Step 2: Map this de-identified motion data to a predefined avatar with a morphologically-realistic computational model of the human respiratory system.





The model should provide the ability to study susceptible populations (elderly, children, diseased), as well as allow the study of toxic contaminants of concern (anthrax, ricin) - providing predictive data where it is currently lacking (clean-up thresholds, health thresholds, etc) using computational fluid dynamics.

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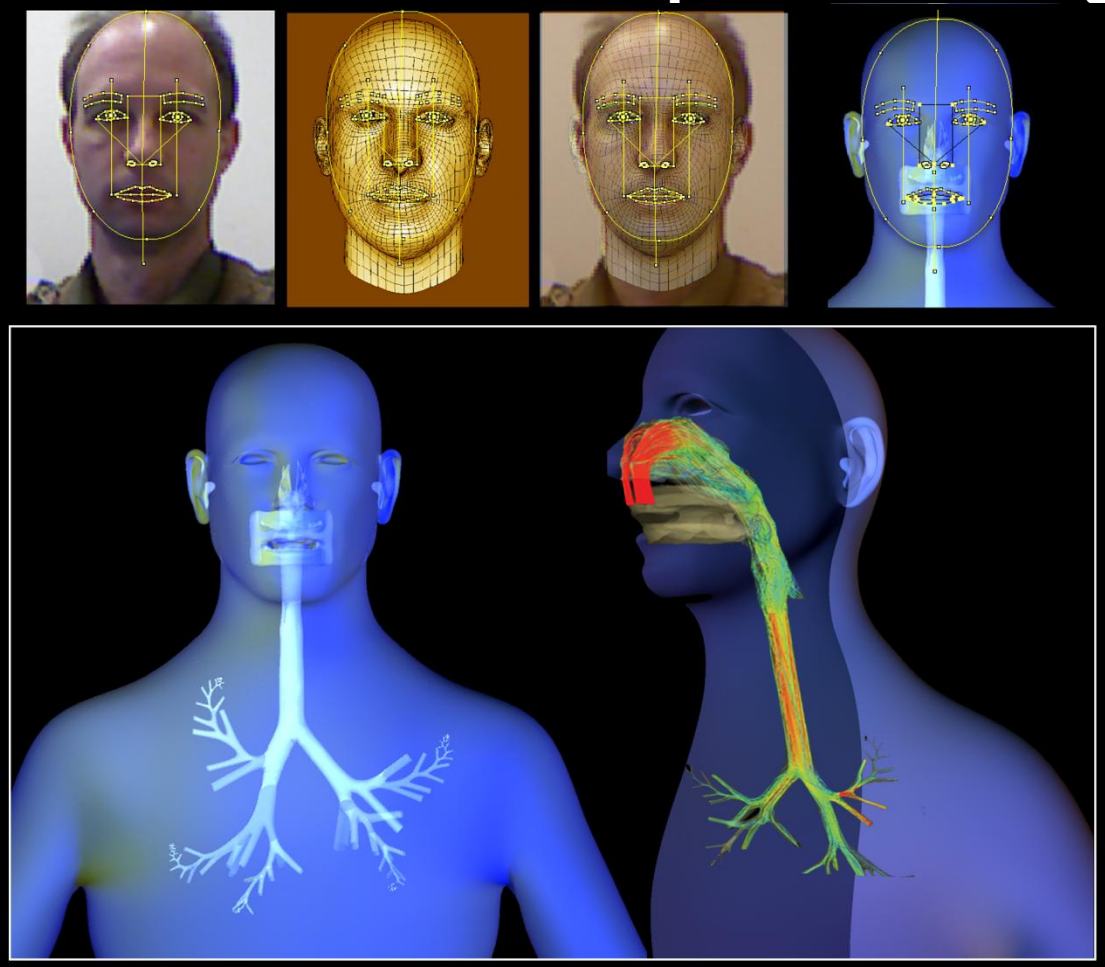

Summary :
Create a digital database using the Kinect for Windows scanners allowing motion capture data to drive a morphologically-realistic computational model of the human respiratory system.