Respiratory mask is the last protection means in many medical and industrial occasions. Mask must fit tightly with the face of the user wearing it to function properly. Thus the shape of respiratory mask must be determined by some key dimensions of human face. However, human face is a highly complex geometry consisting of free form surfaces. Customized design of 3D mask is still lack of effective solutions. The recent progress of 3D measurement and parametric design technologies has produced potential tools for mass customization of medical products. To fulfill this need, this project aims at developing innovative software solutions for 3D design customization of respiratory mask. Collaborating with Logistic Technology Co. Ltd, we plan to integrate 3D measurement, image processing, mesh modeling, and parametric design in the solutions. Our goal is to develop new design and evaluation functions of the half-face mask driven by the dimensions of human face. Parametric design techniques will be applied to human face modeling, which facilitates quick construction and modification of the mask design. We will build up a database of 3D human face models using the 3D scanning technology developed by the company. The database serves as a foundation for a generalized parametric model of human face. The model is manipulated by the key dimensions of human face automatically identified from 3D measurement data. In addition, a virtual design evaluation technology will be developed in this project to characterize the quality of the mask design. The fitness of the mask with respect to the human face will be calculated and visually shown in 3D space. This project will significantly enhance the values of the current measurement technologies in Logistic Technology Co. Ltd. It may open up a novel business model of customized design service for respiratory mask and other medical products related to human face.

Keywords: respiratory mask, design customization, 3D measurement, human face modeling