CANCER PREVENTION & RESEARCH INSTITUTE OF TEXAS

Award ID:
RP120053

Project Title:
Beam-Scanning Radar for Tumor Tracking in Lung Cancer Radiotherapy

Award Mechanism:
High Impact/High Risk

Principal Investigator:
Li, Changzhi

Entity:
Texas Tech University

Lay Summary:

The proposed research aims to solve the tumor tracking problem in lung cancer radiotherapy using innovative beam-scanning radar. Lung cancer is the leading cause of cancer death in the United States. More people die from lung cancer each year than breast, prostate, colon, liver, kidney and melanoma cancers combined. The treatment outcome of the current modalities has been poor. Radiotherapy is a major treatment of lung cancer, either alone or combined with surgery and chemotherapy. Studies have shown that an increased radiation dose to the tumor will lead to improved survival rates. However, because lung tumors can move significantly with respiratory motion, it is very difficult to deliver sufficient radiation dose without damaging the surrounding healthy lung tissue. The solution to this problem is tumor tracking, a method to dynamically target the tumor with the radiation beam, allowing a reduction in the volume of healthy tissue exposed to a high dose. In order for the radiation beam to follow the tumor, the location of the tumor must be known in real time with high precision. The state of the art technology to locate tumor is either invasive to the patients or does not have sufficient accuracy. To address these issues, we will devise novel beam-scanning radar to non-invasively monitor the chest and abdomen movements, from which, tumor location can be tracked and thus accurate signals can be derived to control the radiation beam. We will incorporate tumor tracking algorithm to obtain tumor location accurately. We will demonstrate the feasibility using a phantom that mimics the patient. The proposed research is the first attempt to use beam-scanning radar for accurate tumor tracking. Compared with existing technologies, it is non-invasive and highly accurate due to the wireless link to chest/abdominal motion, has no side effect, and is insensitive to clothing and chest hair. It can generate a transformative evolution to lung cancer radiotherapy.