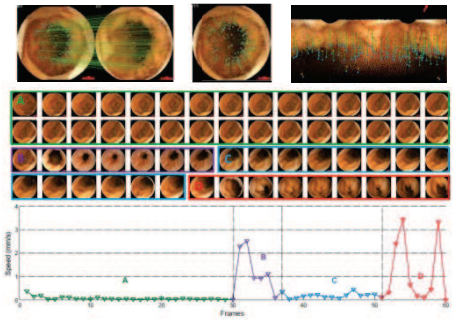
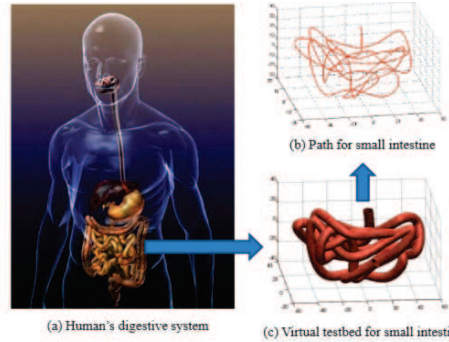
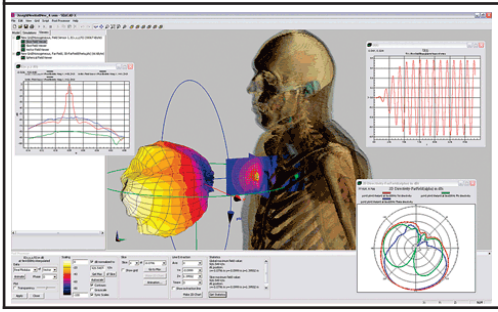
Modeling the Speed of WCE using Endoscopic Images



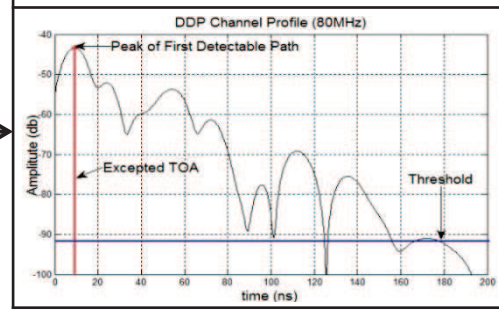
Map generation and visual tesbed design



RF propagation simulation using Semcad X



Algorithm design for RF localization



Algorithm design of Body-SLAM & performance evaluation

Initial estimates for $\hat{\boldsymbol{m}}_{t-1}$ and $\boldsymbol{P}_{t-1}$

Motion Update ("Predict")

- *Predict the motion state:*

$$\hat{\boldsymbol{m}}_t^- = \boldsymbol{A}\hat{\boldsymbol{m}}_{t-1}$$

- *Predict the error covariance*

$$\boldsymbol{P}_t^- = \boldsymbol{A}\boldsymbol{P}_{t-1}\boldsymbol{A}^T + \boldsymbol{Q}$$

- *Update the transition matrix* $\boldsymbol{A}$ *through video by:*

$$\mathbb{R} = \mathbb{R} \cdot \mathbb{R}_t \cdot \mathbb{R}^{-1}$$

RF Measurement Update ("Correct")

- *Compute the Kalman gain:*

$$\boldsymbol{K}_t = \boldsymbol{P}_t^- \boldsymbol{H}^T (\boldsymbol{H}\boldsymbol{P}_t^- \boldsymbol{H}^T + \boldsymbol{R})^{-1}$$

- *Update motion state with actual RF measurement* $\mathbf{z}_t$*:*

$$\hat{\boldsymbol{m}}_t = \hat{\boldsymbol{m}}_t^- + \boldsymbol{K}_t(\boldsymbol{z}_t - \boldsymbol{H}\hat{\boldsymbol{m}}_t^-)$$

- *Update the error covariance:*

$$\boldsymbol{P}_t = (1 - \boldsymbol{K}_t\boldsymbol{H})\boldsymbol{P}_t^-$$