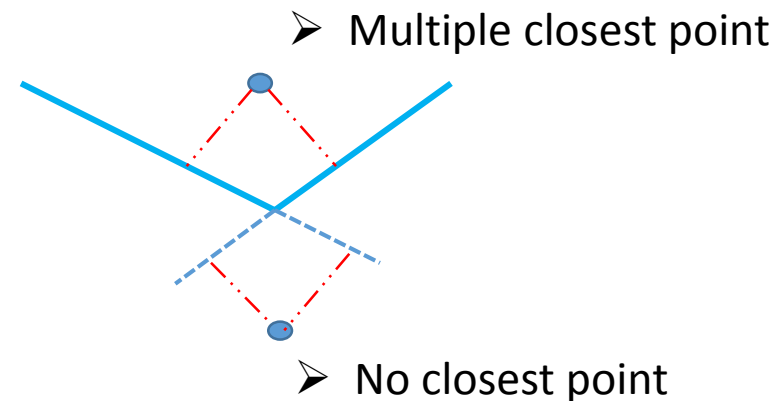
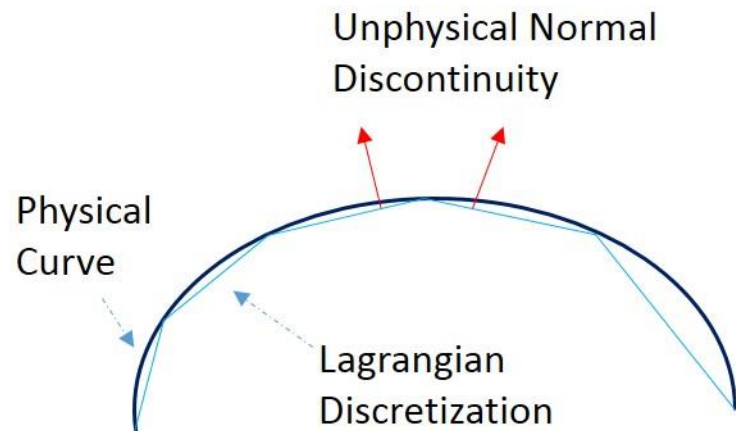


# Isogeometry Analysis of Elasto-static Contact

Xiaoyong Bai

# Advantages of Isogeometry Contact

- ❖ Maintain the exact geometry
- ❖ Maintain the smoothness
- ❖ Contact surface can be obtained from the body



# Isogeometry Contact: Weak Form

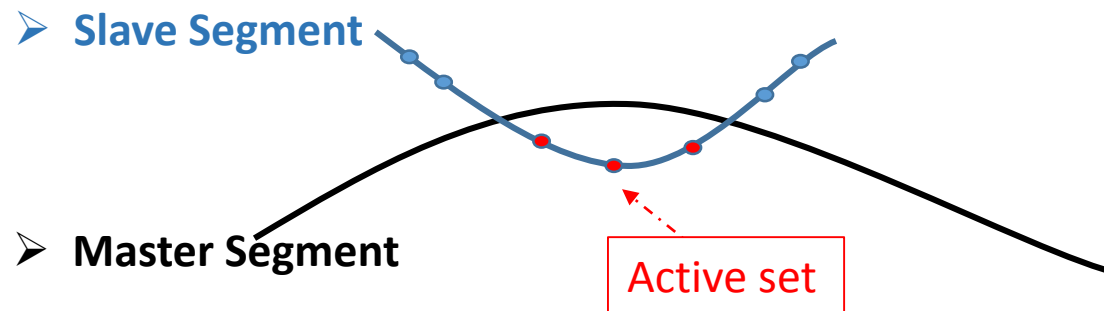
$$\Pi = \Pi_e + \Pi_{ext} + \Pi_c$$

❖ Penalty method

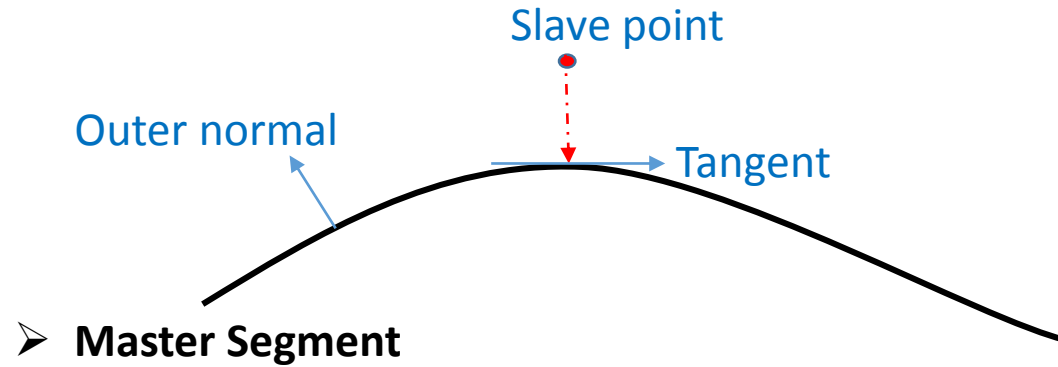
$$\Pi_c = \frac{1}{2} \int_c \epsilon < -g_N >^2 da$$

❖ Discretization: Knot to segment

$$\Pi_c = \frac{1}{2} \sum_{\text{Active set}} \epsilon < -g_N >^2$$



# Closest point projection and active set finding



```
function [ Closet_Point, Master_P, active] =  
          Closet_Point_Curve(Slave_P, p, Xi, P, W, normal_type)
```

# Multi-patch and contact coupling

$$K_c = \frac{\partial^2 \Pi_c}{\partial u^2}$$

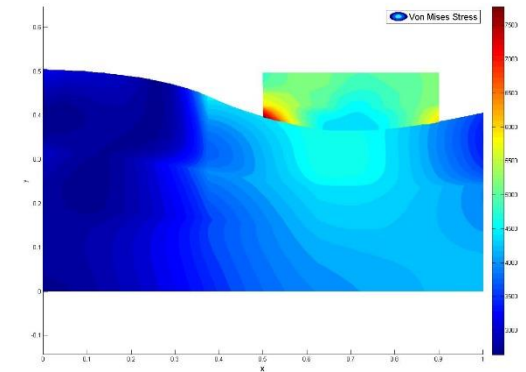
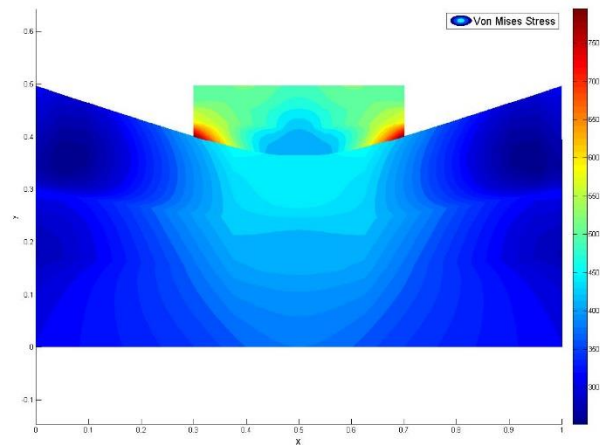
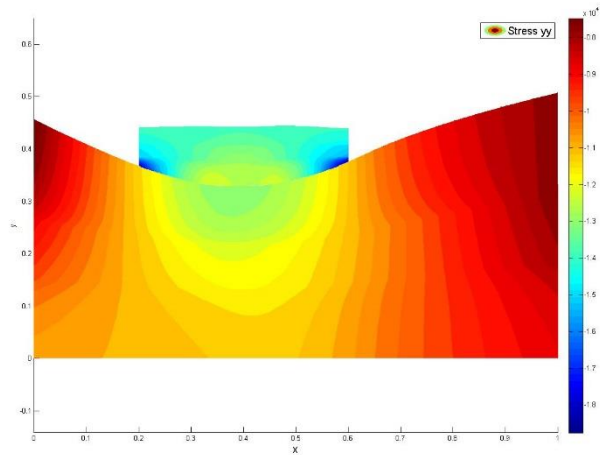
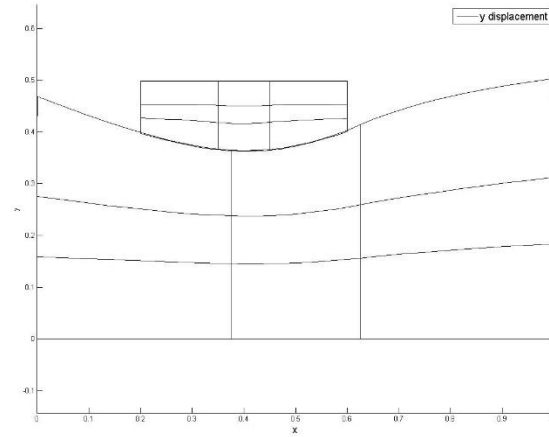
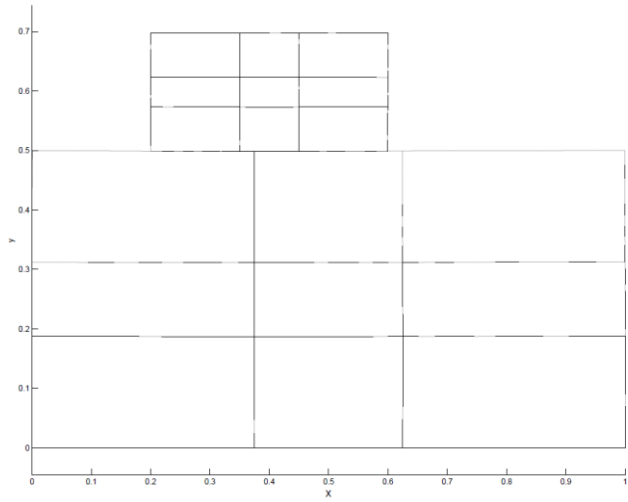
$$\left\{ \begin{bmatrix} K_1 & 0 \\ 0 & K_2 \end{bmatrix} + K_c \right\} \begin{bmatrix} u_1 \\ u_2 \end{bmatrix} = \begin{bmatrix} f_1 \\ f_2 \end{bmatrix}$$

Patch 2

Patch 1

# Contact of two block

Prescribed Displacement at top



# Simple patch test (1)

Pressure = -10000 Pa

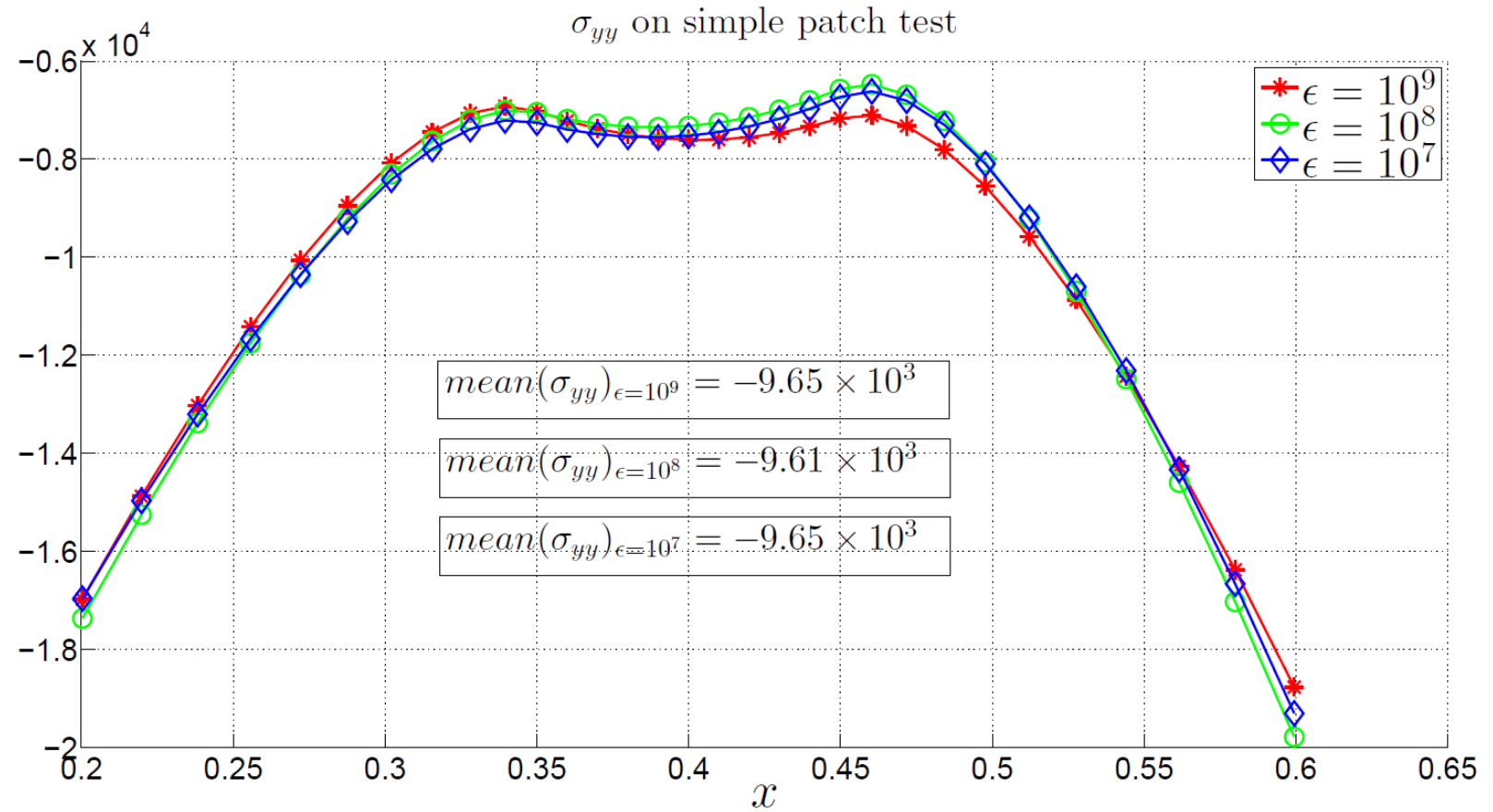
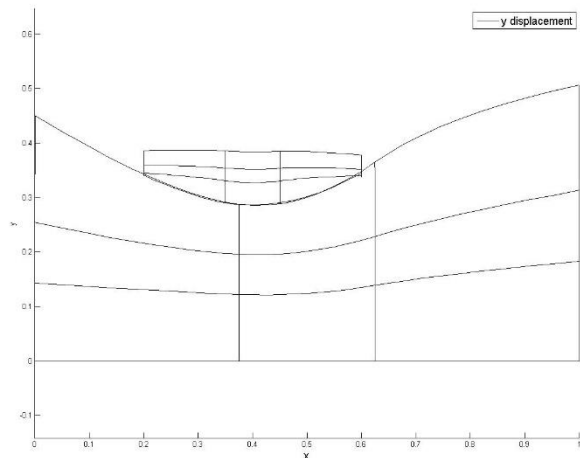
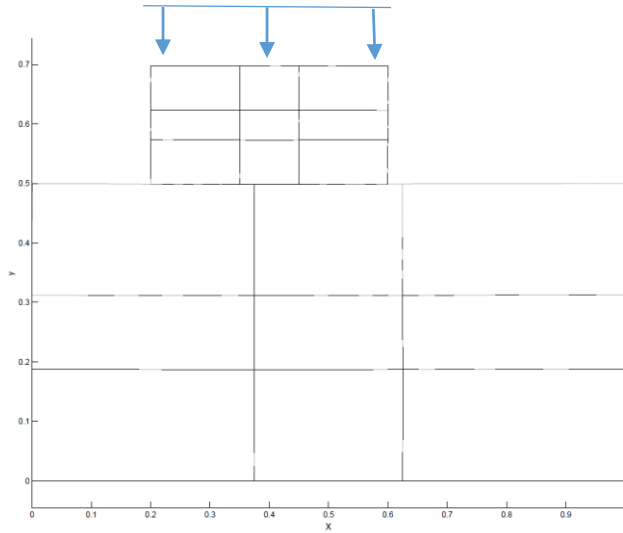
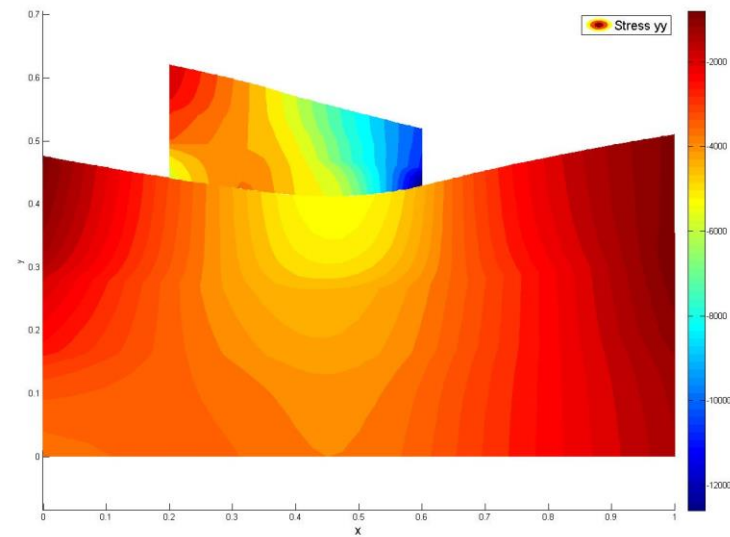
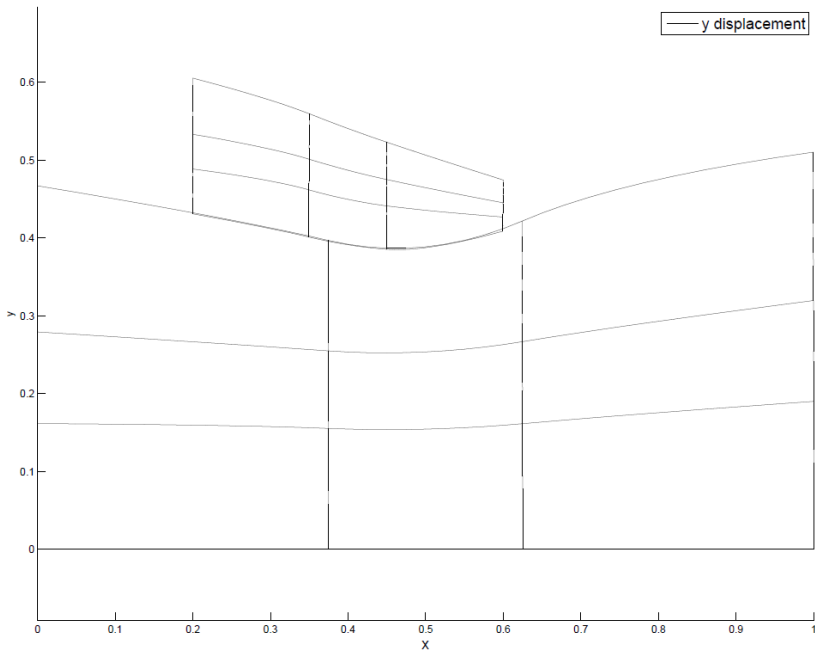
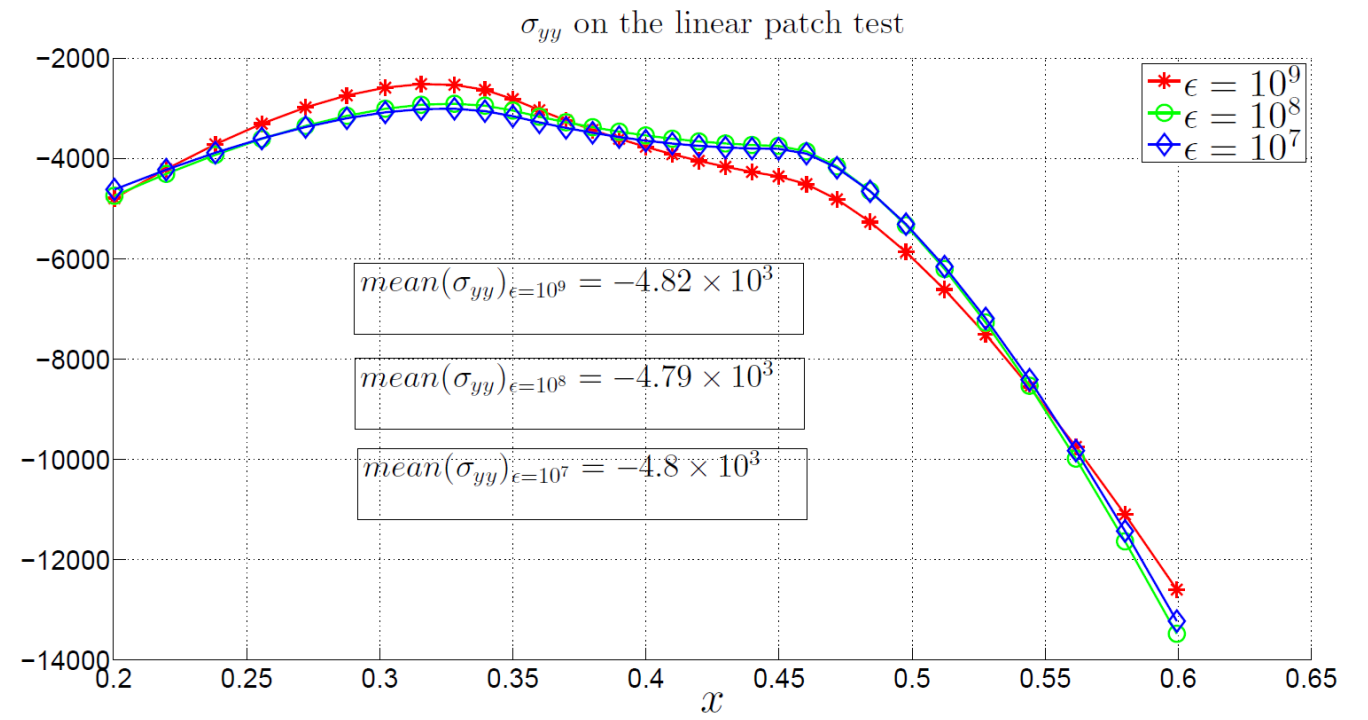
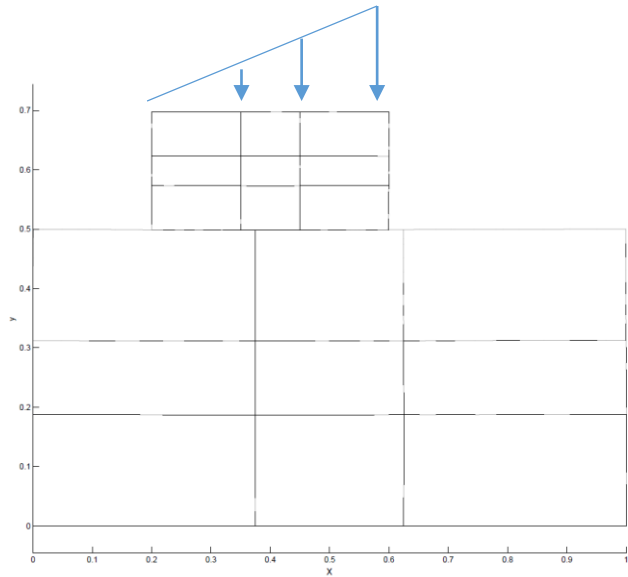


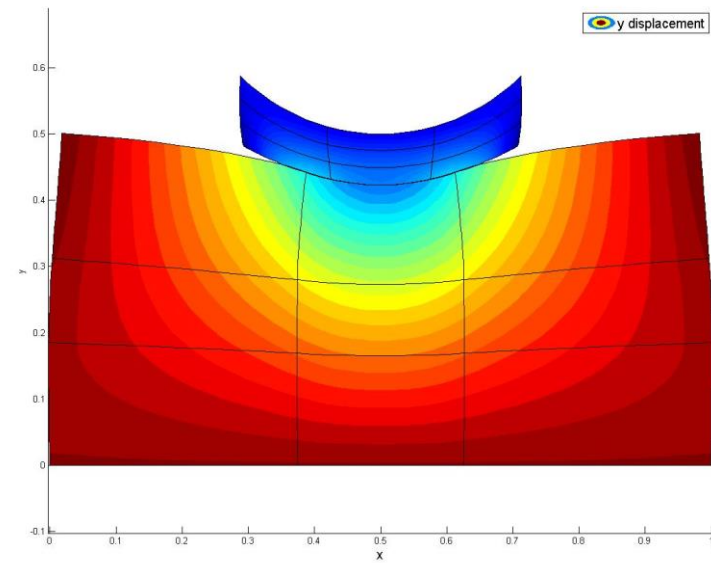
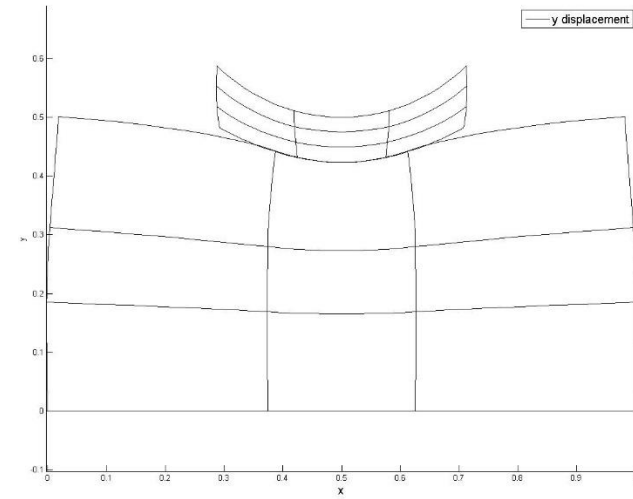
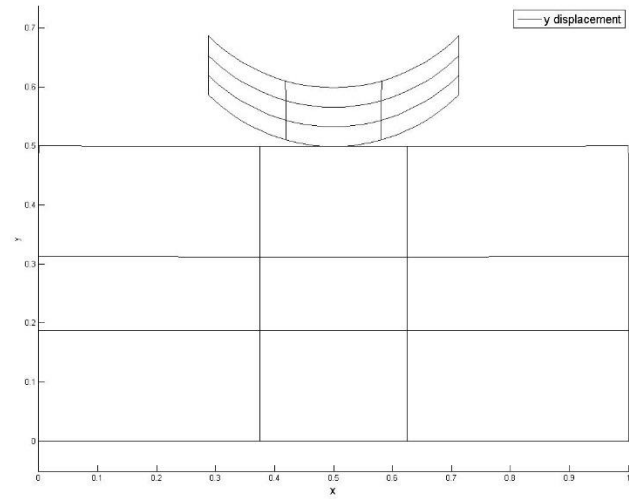
Figure 3: Problem 1 simple test

# Simple patch test (2)





# Wheel contact



Thanks!