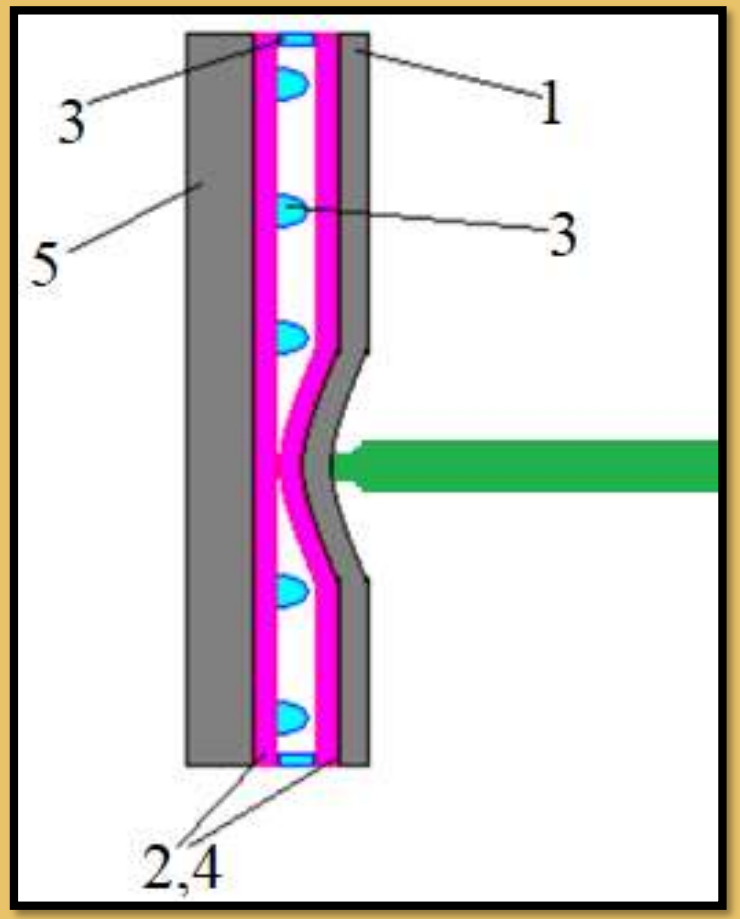
Mikroprocesorski merno-informacioni sistemi 2

Vežbe 6

Rezistivni touch panel

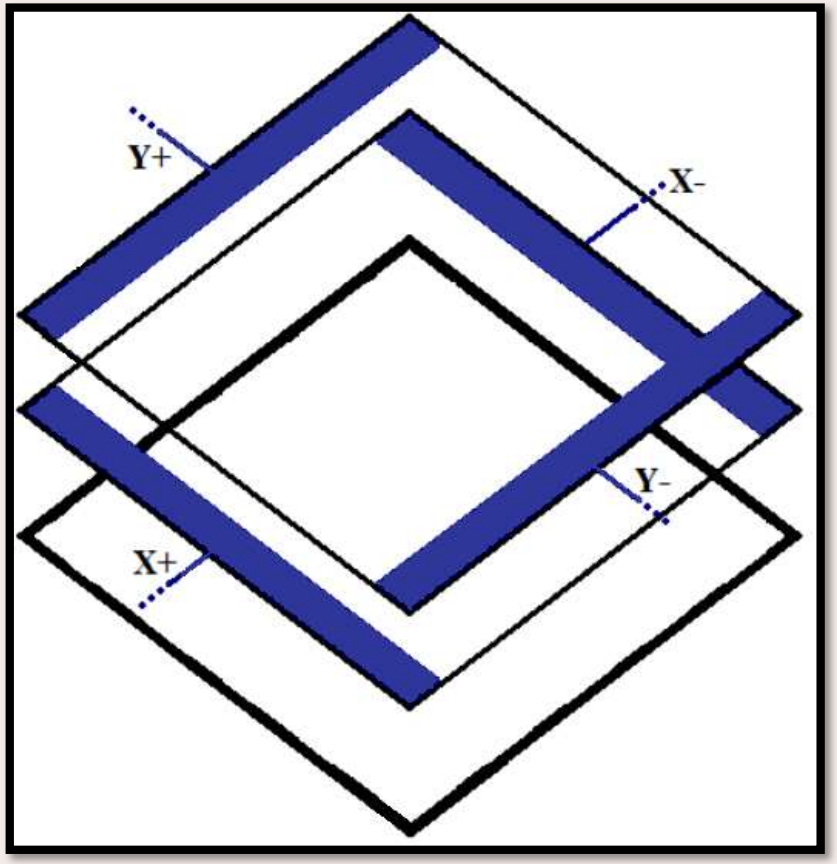


- **Slojevi rezistivnog touch panela:**
  1. **Fleksibilna membrana od PET-a**
  2. **Provodni film**
  3. **Spacer**
  4. **Provodni film**
  5. **Supstrat od stakla/akrila**

- **Fleksibilna membrana i supstrat prekiriveni su provodnim filmom.**
- **Pritiskom na fleksibilnu membranu ostvaruje se kontakt dva provodna filma.**

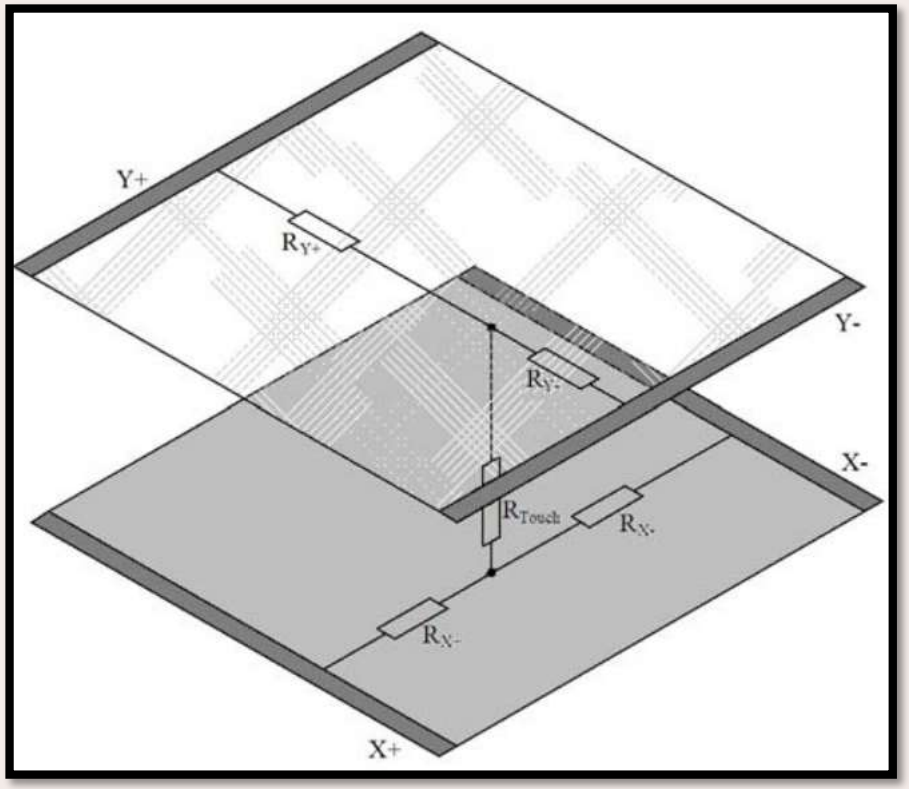
4-wire rezistivni touch panel

- Par elektroda u provodnim slojevima.
- 4 linije X-, X+, Y- i Y+ se povezuju na kontroler panela.
- Veoma osetljivi na bouncing.



4-wire rezistivni touch panel

- Slojevi se mogu posmatrati kao serijska veza otpornika u tački dodira.
- Pritiskom na panel menja se otpornost kontakta dva sloja R_{touch}.
- Što je pritisak na panel jači to je R_{touch} manje.
- Merenjem napona u toj tački dobijamo informaciju o poziciji kontakta.

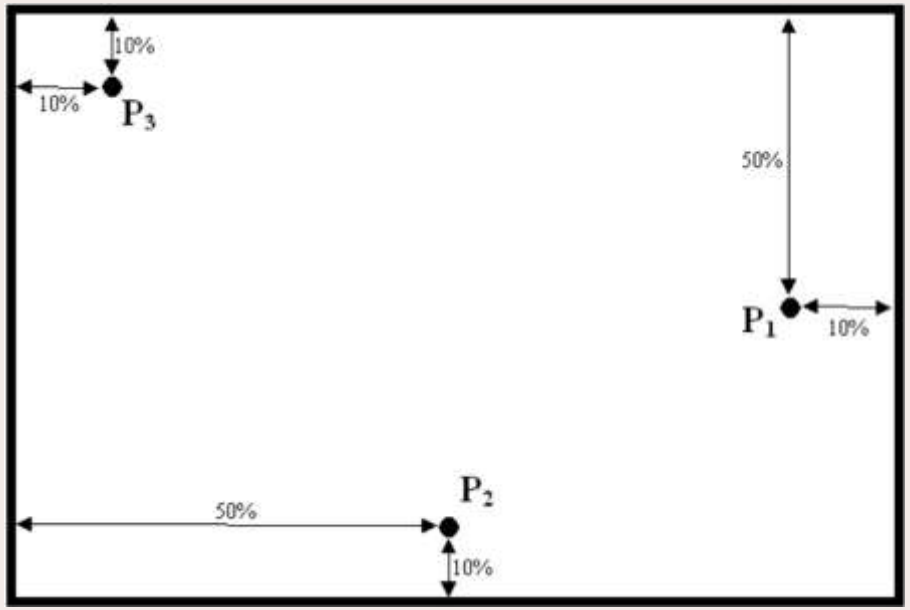


	$X+_{Excite}$	$X-_{Excite}$	$Y+_{Excite}$	$Y-_{Excite}$
Standby	Gnd	Hi-Z	Hi-Z	Pull up / Int
X-Coordinate	Gnd	Vcc	Hi-Z	Hi-Z / ADC
Y-Coordinate	Hi-Z	Hi-Z / ADC	Gnd	Vcc

Kalibracija touch panela

- Kalibracija je neophodna kako bi se od izmerenih vrednosti sa izlaza A/D konvertora dobile koordinate ekrana.
- X_D, Y_D – koordinate ekrana
- X_T, Y_T – koordinate touch panela (izlaz A/D konvertora)
- Kalibracija u tri tačke.

$$X_D = A(X_T) + B(Y_T) + C$$
$$Y_D = D(X_T) + E(Y_T) + F$$



$$X_{D1} = A(X_{T1}) + B(Y_{T1}) + C$$
$$X_{D2} = A(X_{T2}) + B(Y_{T2}) + C$$
$$X_{D3} = A(X_{T3}) + B(Y_{T3}) + C$$
$$Y_{D1} = D(X_{T1}) + E(Y_{T1}) + F$$
$$Y_{D2} = D(X_{T2}) + E(Y_{T2}) + F$$

Kalibracija touch panela

$$A = \frac{(X_{D1} - X_{D3})(Y_{T2} - Y_{T3}) - (X_{D2} - X_{D3})(Y_{T1} - Y_{T3})}{(X_{T1} - X_{T3})(Y_{T2} - Y_{T3}) - (X_{T2} - X_{T3})(Y_{T1} - Y_{T3})}$$

$$= \frac{X_{D1}(Y_{T2} - Y_{T3}) + X_{D2}(Y_{T3} - Y_{T1}) + X_{D3}(Y_{T1} - Y_{T2})}{X_{T1}(Y_{T2} - Y_{T3}) + X_{T2}(Y_{T3} - Y_{T1}) + X_{T3}(Y_{T1} - Y_{T2})}$$

$$B = \frac{(X_{T1} - X_{T3})(X_{D2} - X_{D3}) - (X_{D1} - X_{D3})(X_{T2} - X_{T3})}{(X_{T1} - X_{T3})(Y_{T2} - Y_{T3}) - (X_{T2} - X_{T3})(Y_{T1} - Y_{T3})}$$

$$= \frac{A(X_{T3} - X_{T2}) + X_{D2} - X_{D3}}{(Y_{T2} - Y_{T3})}$$

$$C = \frac{Y_{T1}[X_{T3}(X_{D2}) - X_{T2}(X_{D3})] + Y_{T2}[X_{T1}(X_{D3}) - X_{T3}(X_{D1})] + Y_{T3}[X_{T2}(X_{D1}) - X_{T1}(X_{D2})]}{(X_{T1} - X_{T3})(Y_{T2} - Y_{T3}) - (X_{T2} - X_{T3})(Y_{T1} - Y_{T3})}$$

$$= X_{D3} - AX_{T3} - BY_{T3}$$

Kalibracija touch panela

$$D = \frac{(Y_{D1} - Y_{D3})(Y_{T2} - Y_{T3}) - (Y_{D2} - Y_{D3})(Y_{T1} - Y_{T3})}{(X_{T1} - X_{T3})(Y_{T2} - Y_{T3}) - (X_{T2} - X_{T3})(Y_{T1} - Y_{T3})}$$

$$= \frac{Y_{D1}(Y_{T2} - Y_{T3}) + Y_{D2}(Y_{T3} - Y_{T1}) + Y_{D3}(Y_{T1} - Y_{T2})}{X_{T1}(Y_{T2} - Y_{T3}) + X_{T2}(Y_{T3} - Y_{T1}) + X_{T3}(Y_{T1} - Y_{T2})}$$

$$E = \frac{(X_{T1} - X_{T3})(Y_{D2} - Y_{D3}) - (Y_{D1} - Y_{D3})(X_{T2} - X_{T3})}{(X_{T1} - X_{T3})(Y_{T2} - Y_{T3}) - (X_{T2} - X_{T3})(Y_{T1} - Y_{T3})}$$

$$= \frac{D(X_{T3} - X_{T2}) + Y_{D2} - Y_{D3}}{(Y_{T2} - Y_{T3})}$$

$$F = \frac{Y_{T1}[X_{T3}(Y_{D2}) - X_{T2}(Y_{D3})] + Y_{T2}[X_{T1}(Y_{D3}) - X_{T3}(Y_{D1})] + Y_{T3}[X_{T2}(Y_{D1}) - X_{T1}(Y_{D2})]}{(X_{T1} - X_{T3})(Y_{T2} - Y_{T3}) - (X_{T2} - X_{T3})(Y_{T1} - Y_{T3})}$$

$$= Y_{D3} - DX_{T3} - EY_{T3}$$