



UNIVERSITÀ
degli STUDI
di CATANIA

DIPARTIMENTO DI MATEMATICA E INFORMATICA

Non-Rigid Registration per il pre-processing di modelli 3D in ambito senologico

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RELATORE: DARIO ALLEGRA

CORRELATORE: DIEGO SINITÒ

LAUREA MAGISTRALE IN INFORMATICA

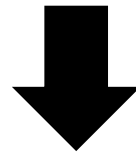
28 LUGLIO 2022

PROBLEMA:

Valutazione oggettiva del risultato di
un'operazione di ricostruzione del seno

Come fare?

Valutazione
simmetria



Valutazione
forma

Approcci correnti

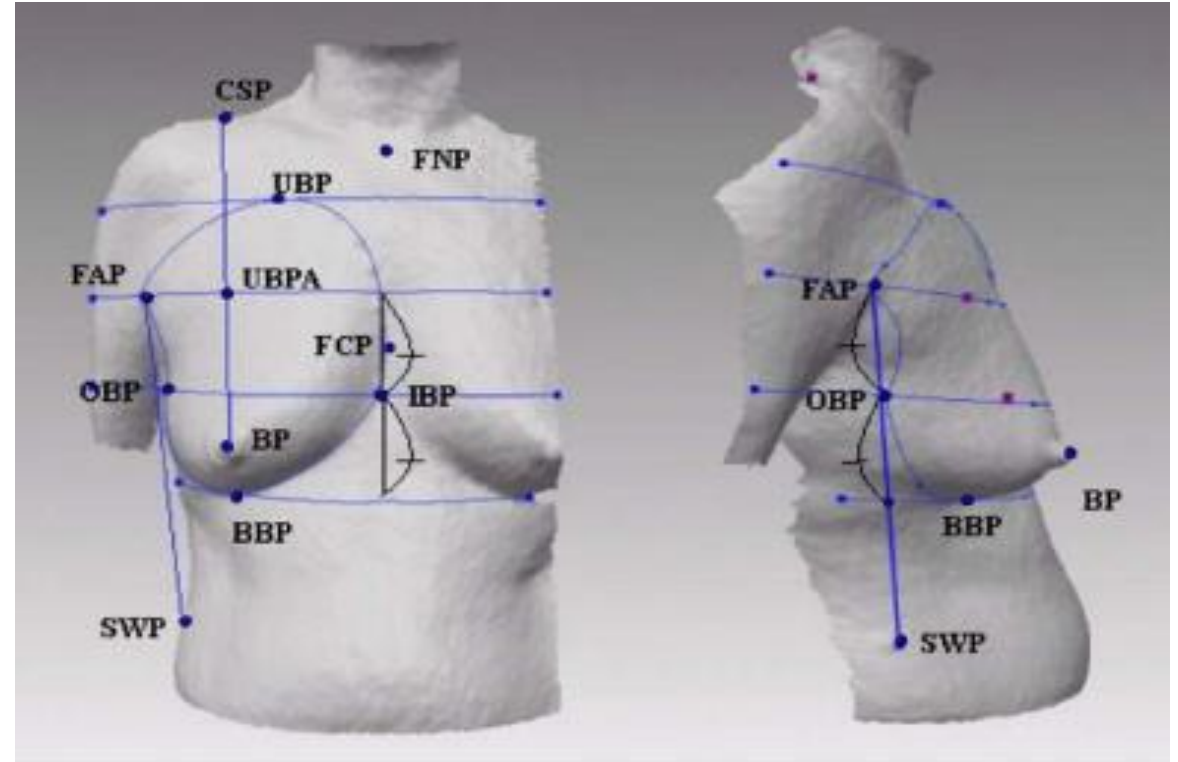
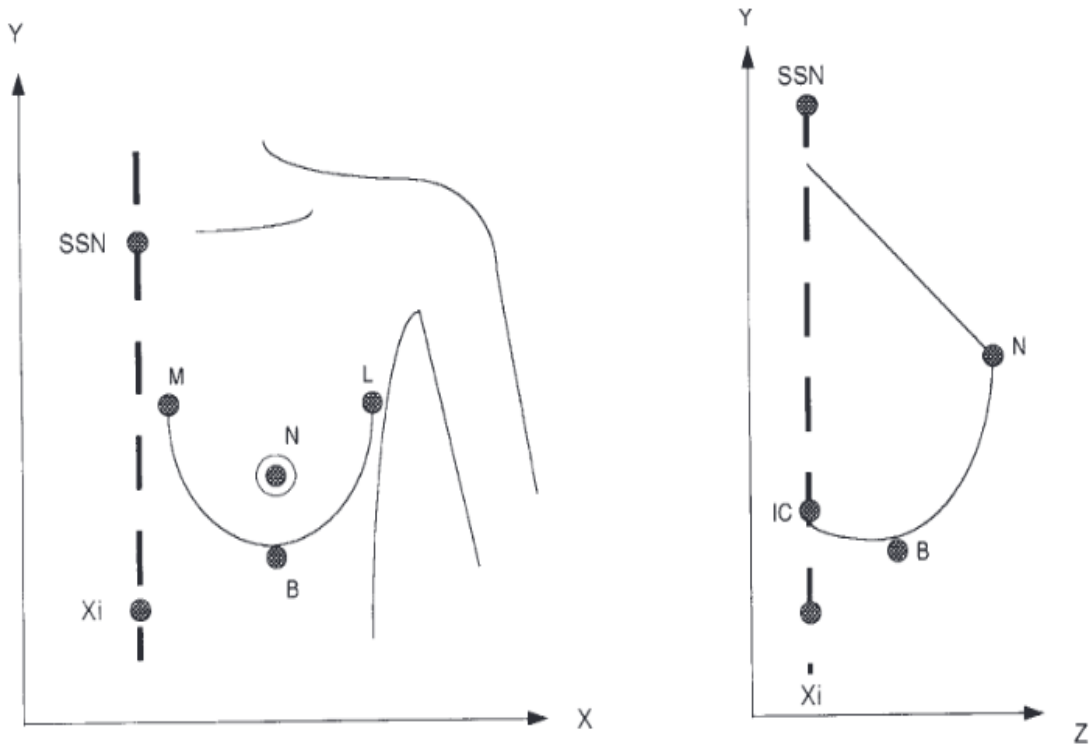
Visita medica e
valutazione fotografica

- Invasività
- Errori di prospettiva
- Assenza di oggettività

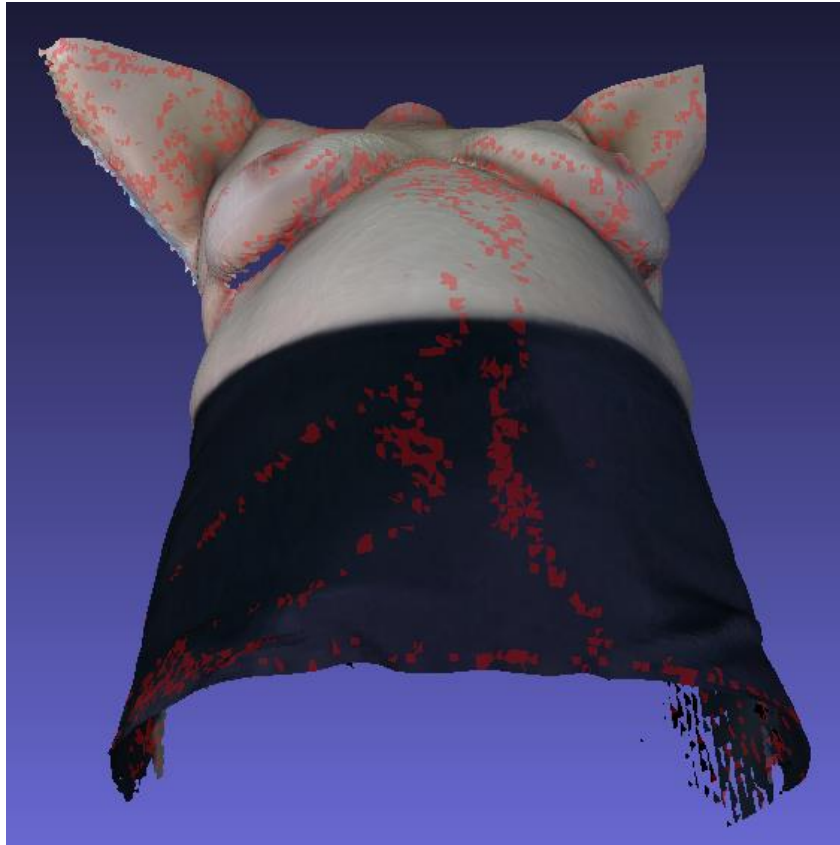


Servono modelli
matematici descrittivi!

Modelli descrittivi



Modelli ottenuti tramite scansione



- Compenetrazione di facce
- Geometria irregolare
- Buchi dovuti a occlusione

Registration

Algoritmi di allineamento e deformazione spaziale

- Rigid o non-rigid
- Con o senza landmark
- ICP, grafi di deformazione, ecc.

Non-rigid ICP

- Trasformazioni separate per ogni vertice
- 2 cicli annidati
- Termini per distanze, rigidità e landmark
- Posizionare i landmark è lento e laborioso

Modifiche apportate

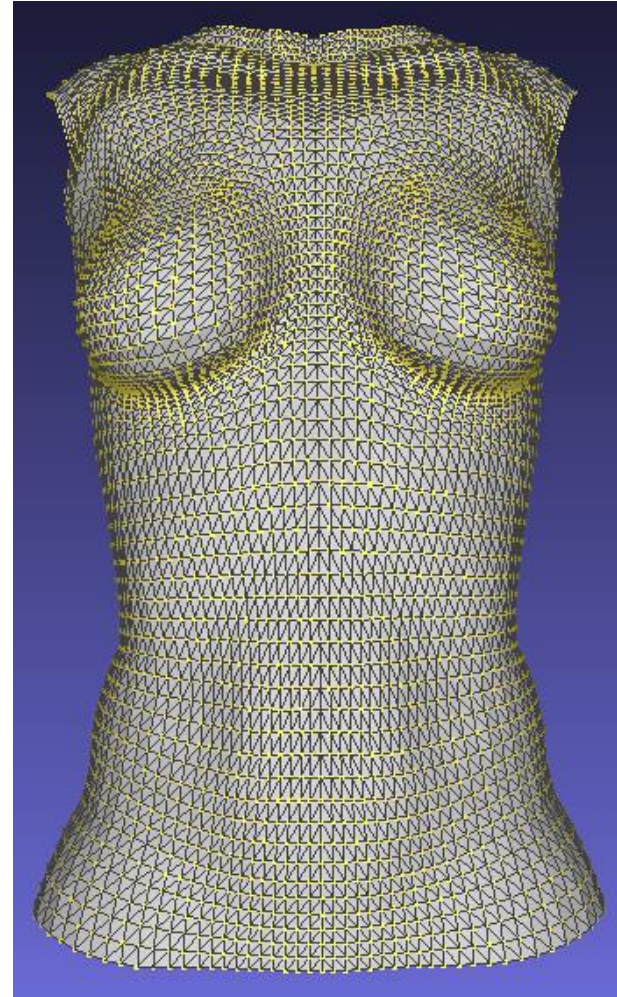
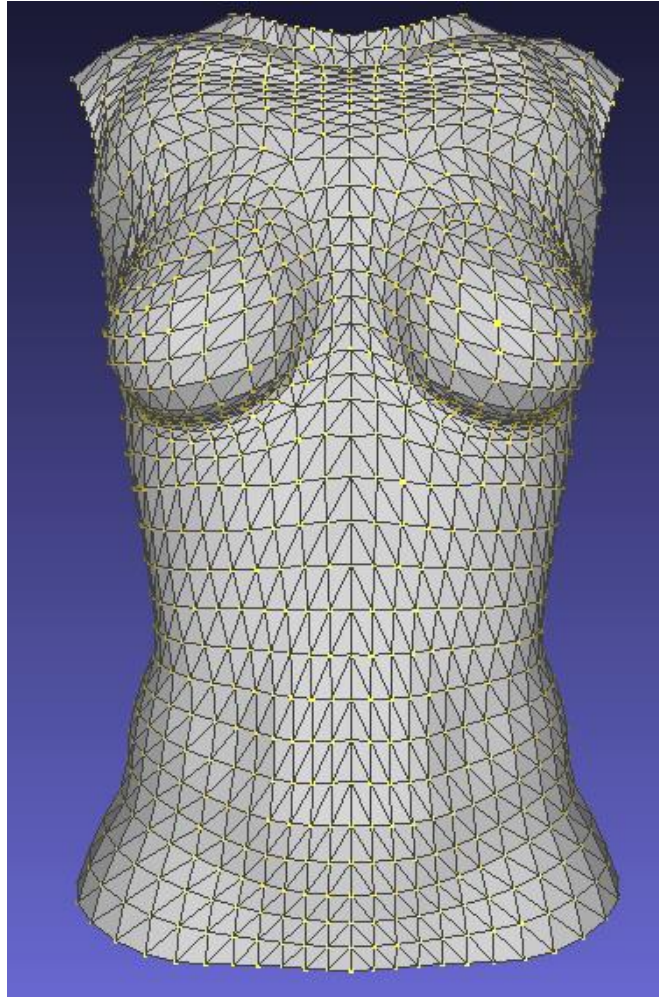
Pulizia e orientamento target

- Rotazione di 180 gradi attorno all'asse X
- Centramento sull'origine
- Rimozione rumore e informazioni aggiuntive

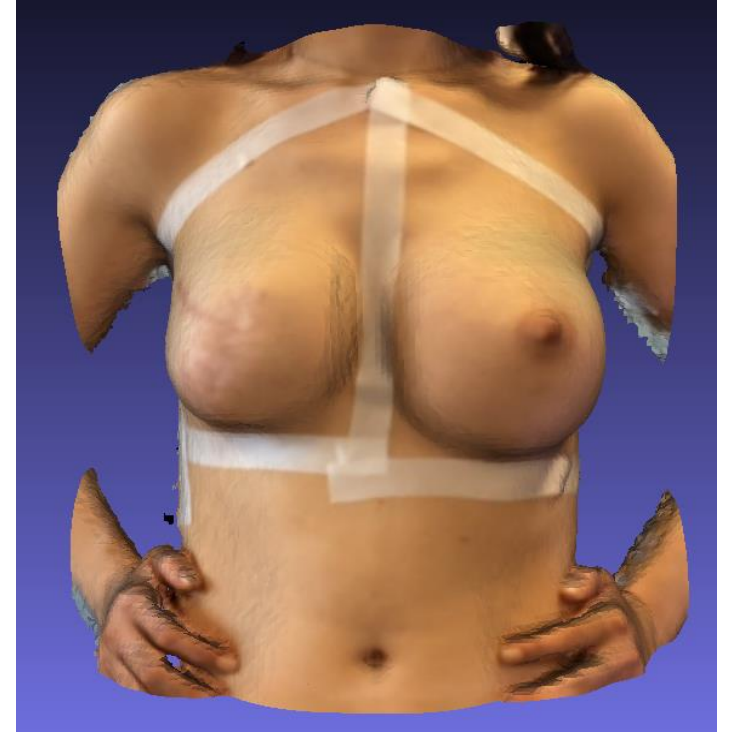
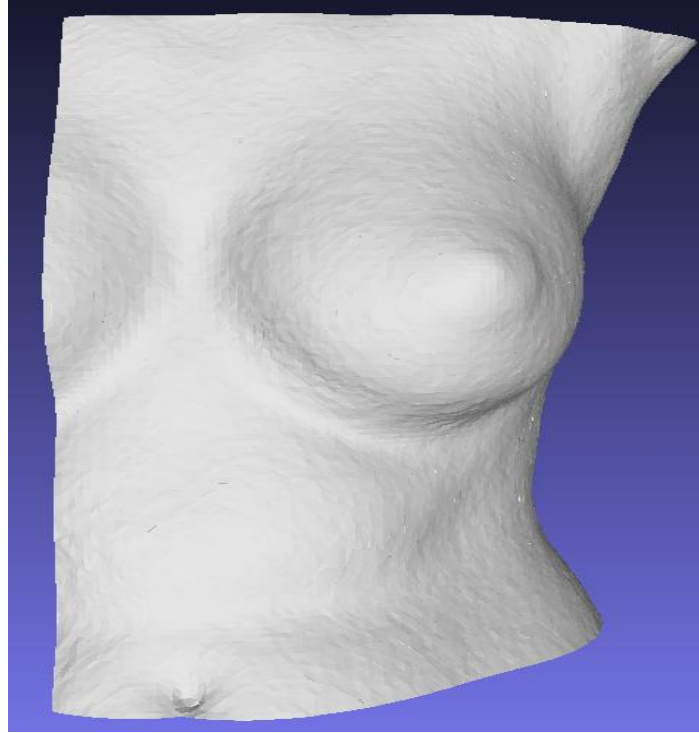
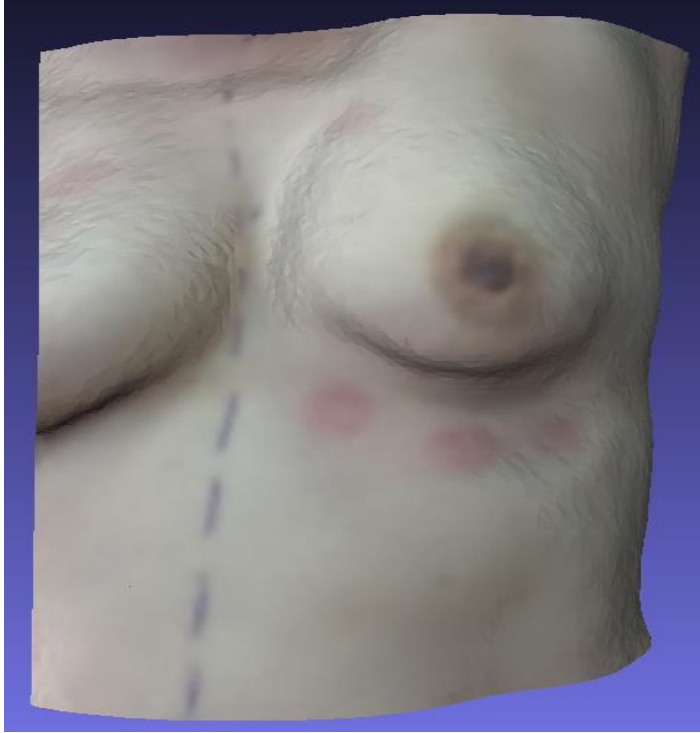
Rimozione landmark

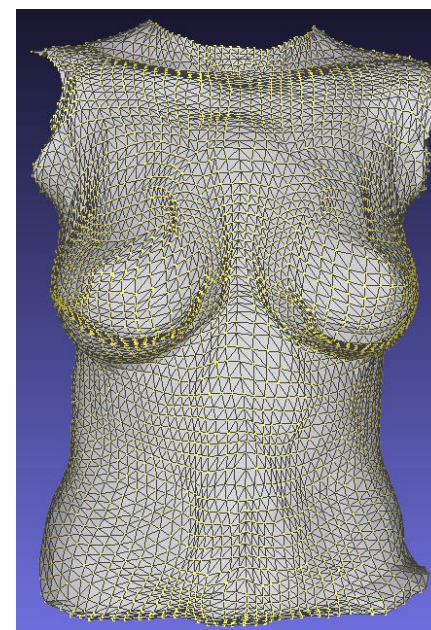
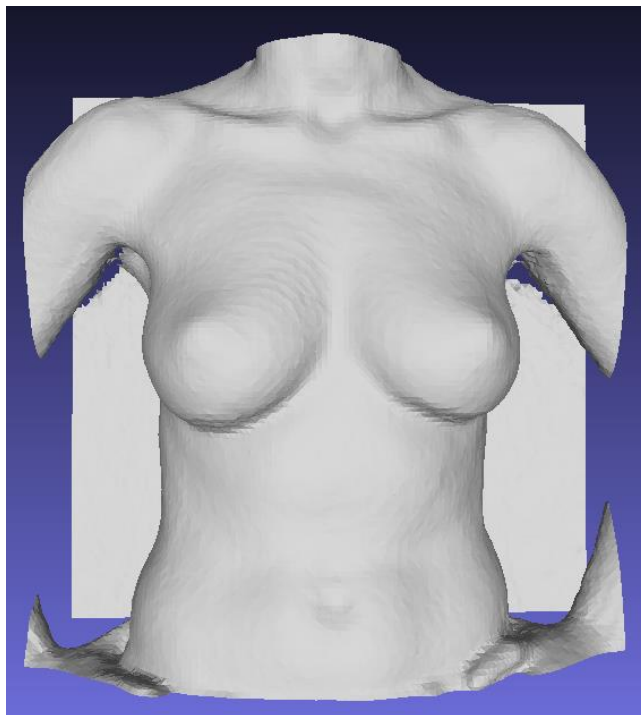
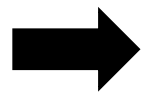
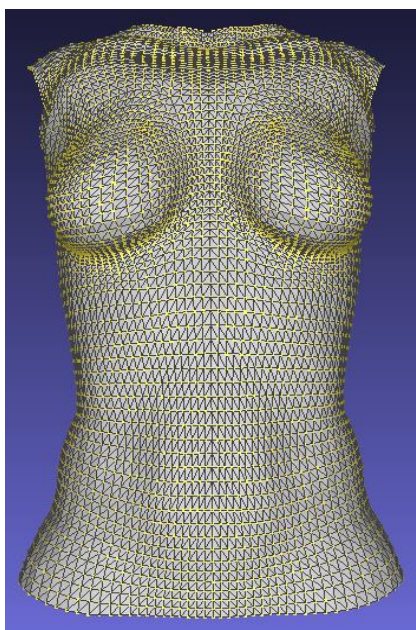
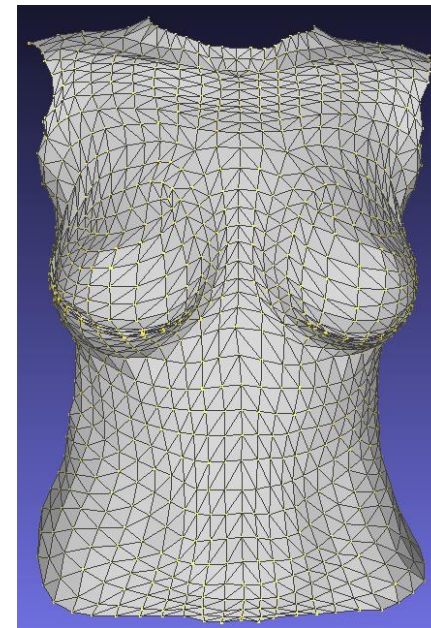
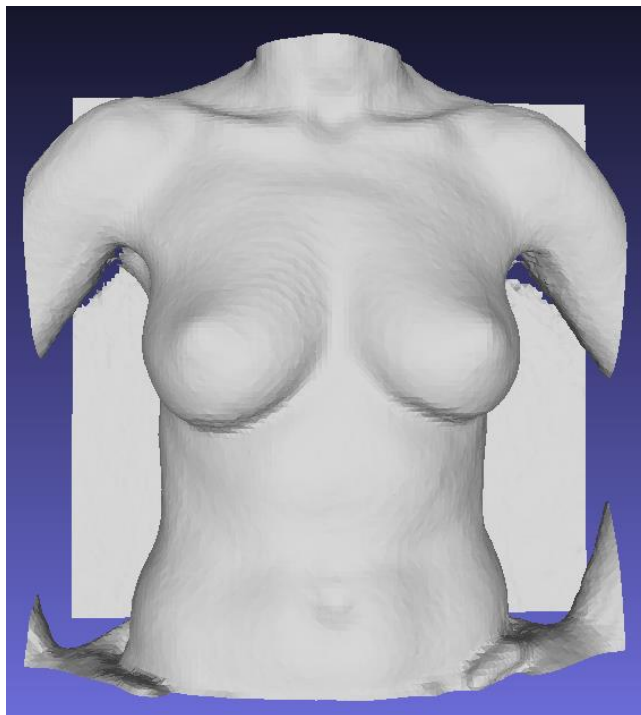
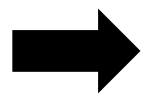
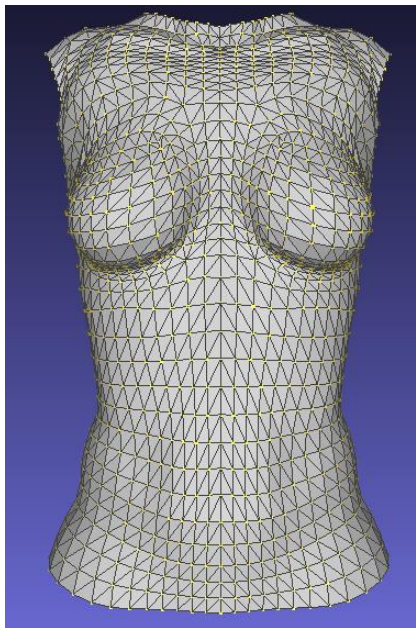
- Minimo globale quando i vertici collassano
- Convergenza a un minimo locale

Template

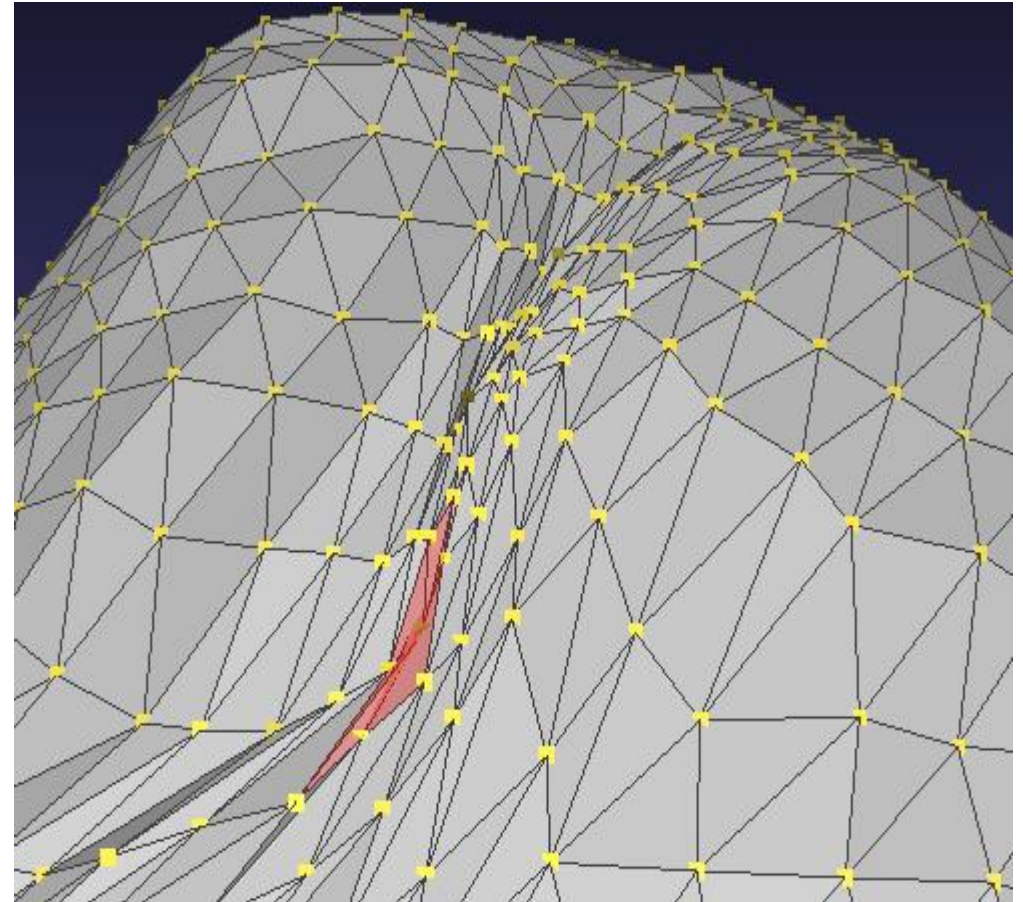
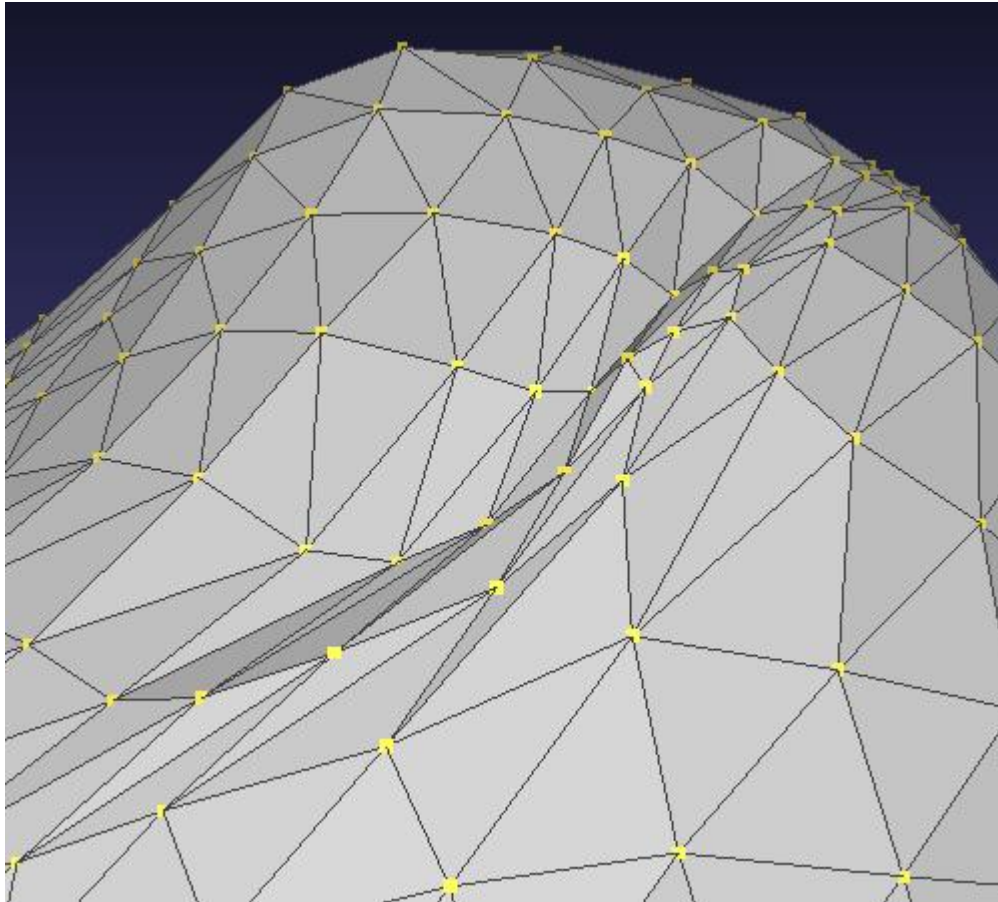


Dataset

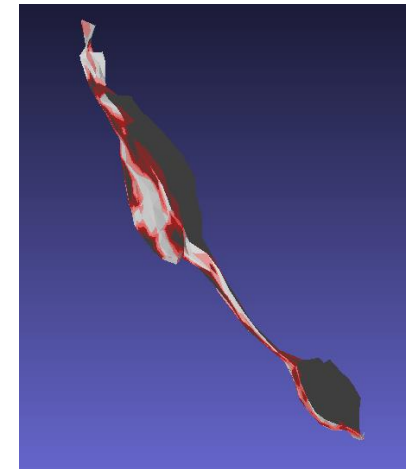
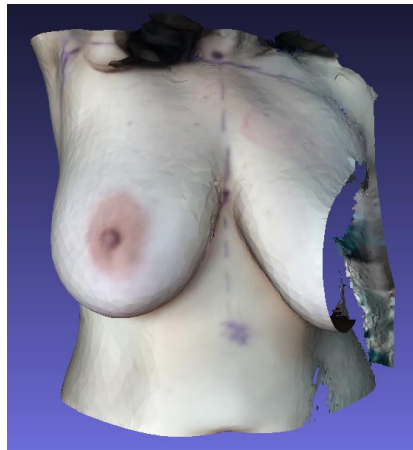
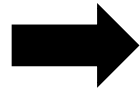
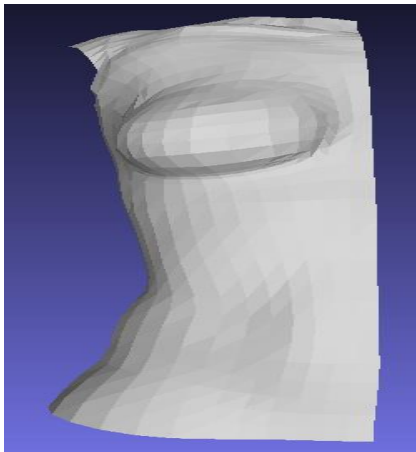
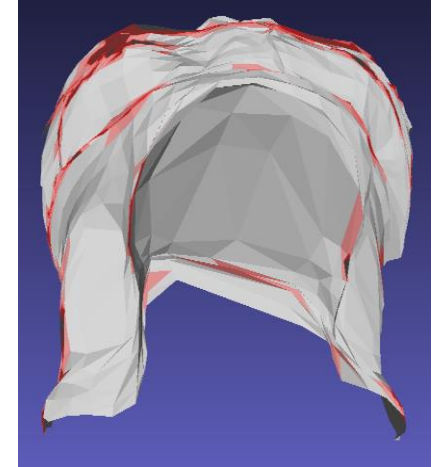
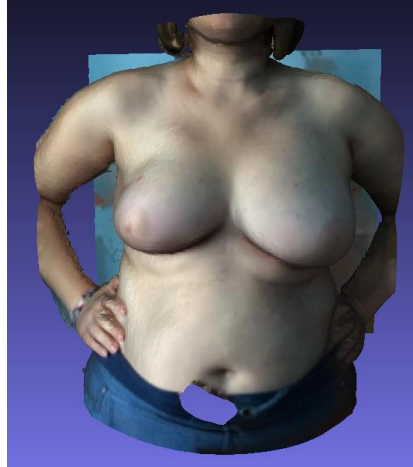
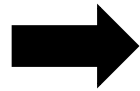
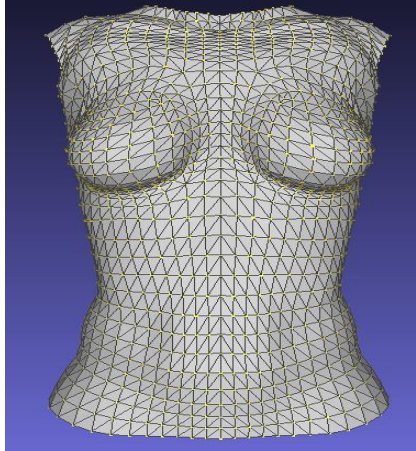




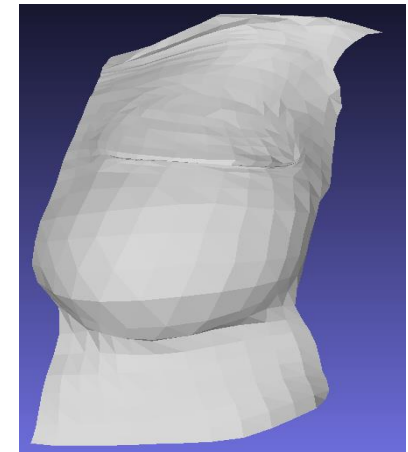
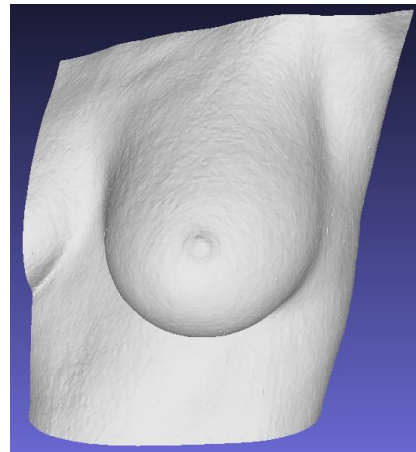
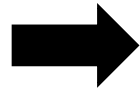
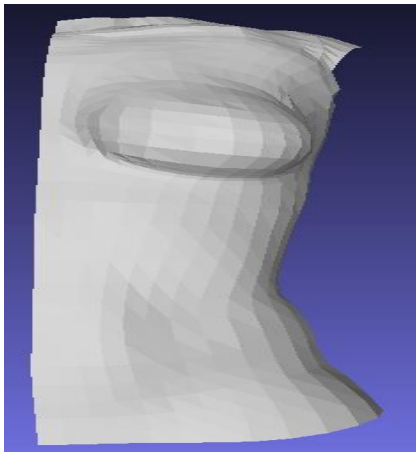
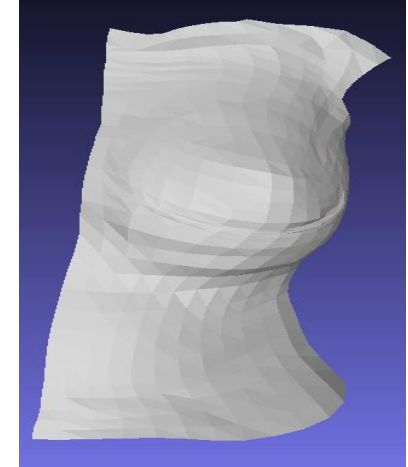
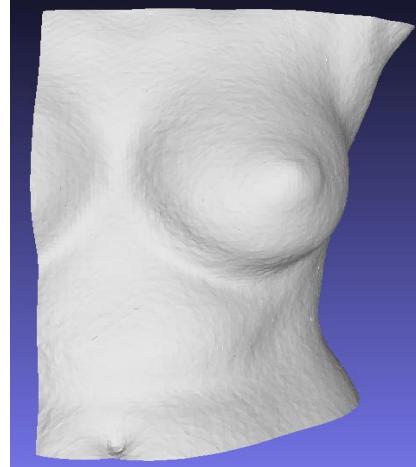
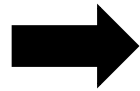
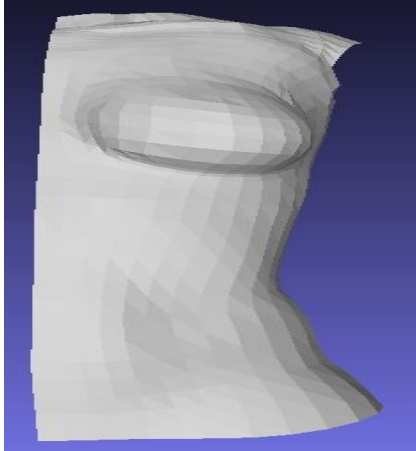
Dettagli test template



Casi peggiori



Casi migliori



Possibili miglioramenti

- Utilizzo di più template
- Scaling del template
- Altre tecniche di allineamento

Grazie a tutti per l'attenzione!