Assignment 2: Question 6

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Target Registration Error Simulation

- Module to analyze the robustness of Target Registration against marker segmentation Errors
- Assume marker Segmentation in the X-ray images the only source of target registration Error
- Analysis entirely in CT Frame

Steps:

- max target registration Error (maxTRE) is 1 mm
- marker Segmentation Error is a vector of random direction and Fixed Magnitude (E_{max})
  - ↳ Start at $E_{max} = 0$
  - ↳ increase by 0.1mm
  - ↳ Stop at Clinical limit maxTRE
- Generate N random ground truth target points inside target envelop in CT
  - ↳ Can use generate random vector

- Project $M1_{CT}$ $M2_{CT}$ $M3_{CT}$ onto X-ray
  - ↳ Can use X-ray projection
- Start Simulation

- For each N ground truth point in evelope, register target point from CT Frame to CT

  for loop of ground truth points in envelope
  - ↳ Use ground truth(i) as target

  ↳ target registration takes target in Frame → target in new Frame

T_B = target Registration (T_A, $M1_A$, M_{2A}, M_{3A}, M_{1B}, M_{2B}, M_{3B})

(T_A: ground truth; M_{1A}, M_{2A}, M_{3A}: Non-spoiled; M_{1B}, M_{2B}, M_{3B}: Spoiled)

$TRE = \max |T_A - T_B|$

if TRE > max TRE exit:

Otherwise increase E_{max}