Biomechanics lab.3
KENOVEA analysis of motion

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Third Stage
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Kinovea – Motion Analysis Software Kinovea is a free, open-source 2D video motion analysis software widely used in sports science, physiotherapy, biomechanics, and prosthetics & orthotics to analyze human movement frame by frame.

What is Kinovea Used For?

- Gait analysis
- Measuring joint angles
- Tracking movement paths
- Calculating velocity and acceleration
- Comparing pre- and post-treatment performance
- Sports technique analysis

https://www.kinovea.org/

Why Use It in Prosthetics?

•Evaluate gait symmetry
•Assess alignment
•Monitor rehabilitation progress
•Improve energy efficiency

1. Frame-by-Frame Analysis
Allows slow motion and frame stepping to precisely observe movement phases (heel strike, mid-stance, toe off).

2. Angle Measurement
You can draw angle tools to measure:
•Knee flexion/extension
•Hip angles
•Ankle dorsiflexion/plantarflexion

3. Distance & Calibration
By calibrating using a known length (e.g., 1 meter), you can measure:
•Step length
•Stride length
•Limb displacement

4. Time Measurement
Calculate:
•Gait cycle duration
•Cadence
•Swing and stance phases

5. Tracking Tool
Automatically tracks a marker placed on a joint to analyze motion trajectory.

6. Annotation Tools
Add:
•Lines
•Arrows
•Text comments
•Drawing overlays

Application in Prosthetics & Orthotics

For example:

✓ Evaluate transtibial amputee gait

✓ Compare sound limb vs prosthetic limb

✓ Assess knee hyperextension

✓ Analyze foot drop

✓ Monitor improvement after alignment adjustment

How to Use Kinovea (Basic Steps)

1.Record a video (side view for sagittal plane analysis).
2.Import the video into Kinovea.
3.Calibrate using a known reference distance.
4.Use angle or tracking tools.
5.Export data or screenshots for reports.

Required Materials

•Laptop with Kinovea installed
•Smartphone or camera (≥60 fps recommended)
•Tripod
•Measuring tape (1 meter reference)
•Reflective or colored markers
•Data recording sheet

Part 1: Video Recording Procedure

1. Position camera perpendicular to walking path (Sagittal Plane).
2. Height: approximately hip level.
3. Distance: 3–5 meters.
4. Ensure good lighting.
5. Place markers on:
    1. Greater trochanter
    2. Lateral femoral condyle
    3. Lateral malleolus
    4. Fifth metatarsal

https://youtu.be/20wOlps_Nj0?si=hwpPvt_oI-JUIh1j

Part 2: Kinovea Analysis Steps

1. Import video
2. Calibrate distance (using 1 meter reference)
3. Identify one full gait cycle
4. Measure:
    1. Knee flexion at initial contact
    2. Peak knee flexion in swing
    3. Ankle angle at heel strike
5. Measure step length
6. Calculate cadence

Clinical Case Example (With Analysis)
Case: Transtibial Amputee
Patient Information:
•45-year-old male
•Right transtibial amputation
•8 months post-prosthetic fitting
•Complains of fatigue

Interpretation
•Decreased knee flexion → Possible prosthetic stiffness
•Short step length → Reduced push-off power
•Trunk lean → Compensation for instability

Observational Findings
•Shorter step length on prosthetic side
•Reduced knee flexion during swing
•Slight trunk lean toward prosthetic side

Recommended Adjustments
✓ Check prosthetic foot alignment
✓ Adjust socket fit
✓ Consider a lighter foot component
✓ Strengthening exercises

Parameter	Sound Limb	Prosthetic Limb
Step Length	0.72 m	0.58 m
Knee Flexion (Swing)	62°	38°
Cadence	95 steps/min	—
Ankle at IC	Neutral	Slight plantarflexion