Department of Robotics & Mechatronics Engineering
University of Dhaka

Course code : RME 4111
Course name : Advanced Robotics Lab

Experiment no : 01
Experiment name : Motion Analysis of Human Finger.

Group no : 02
Group members: 1. Tapos Biswas (JN-092-004)
2. Rabeya Akter (SK-092-015)
3. Safaeid Hossain Arib (FH-092-020)

Prepared by: Name: Rabeya Akter
Roll no: SK-092-015

Submitted to: Dr. Shamim Ahmed Deowan
Associate Professor
Department of Robotics & Mechatronics Engineering
University of Dhaka

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Objective:

1. Study the kinematics and dynamics of human finder motion
2. Design and implement finger motion tracking systems
3. Investigate finger motion in various tasks and applications

Theory:

Motion analysis is a flexible technique that is used in many different industries. It helps with monitoring and tracking the movement of things or people, which strengthens security measures, in the context of surveillance. Motion analysis is used in medicine to diagnose and track patients, allowing for the evaluation of gait patterns, joint movements, and rehabilitation progress. Motion analysis is used in the film business to produce lifelike special effects, record complex motion sequences, and improve animation. Motion analysis is used in automotive crash safety studies to assess the effects of impacts on cars and occupants, assisting in the development of safer automobiles.

Motion analysis is also essential in ballistic firearm studies, aiding in the reconstruction of crime scenes and the study of bullet trajectories. It aids in understanding animal locomotion, researching biomechanics, and examining behavioral patterns in biological science. Motion analysis aids in the exploration of fire dynamics and the creation of fire control tactics, which is beneficial to the study of flame propagation. Finally, motion analysis helps autonomous cars navigate by enabling collision avoidance, path planning, and obstacle identification.

These developments in methods and tools for motion analysis are laying the groundwork for an exciting future with even more varied applications. Sports science and performance analysis are two areas where motion analysis has a lot of potential. Coaches and trainers can learn a lot about technique, biomechanics, and performance enhancement by carefully monitoring athletes' motions. This may result in better training regimens and enhanced athletic performance.

Virtual and augmented reality provide the potential for yet another useful use. By precisely capturing and simulating natural human movement, motion analysis may help create immersive and realistic virtual environments. This can improve virtual training simulations, gaming experiences, and even industrial and architectural design.

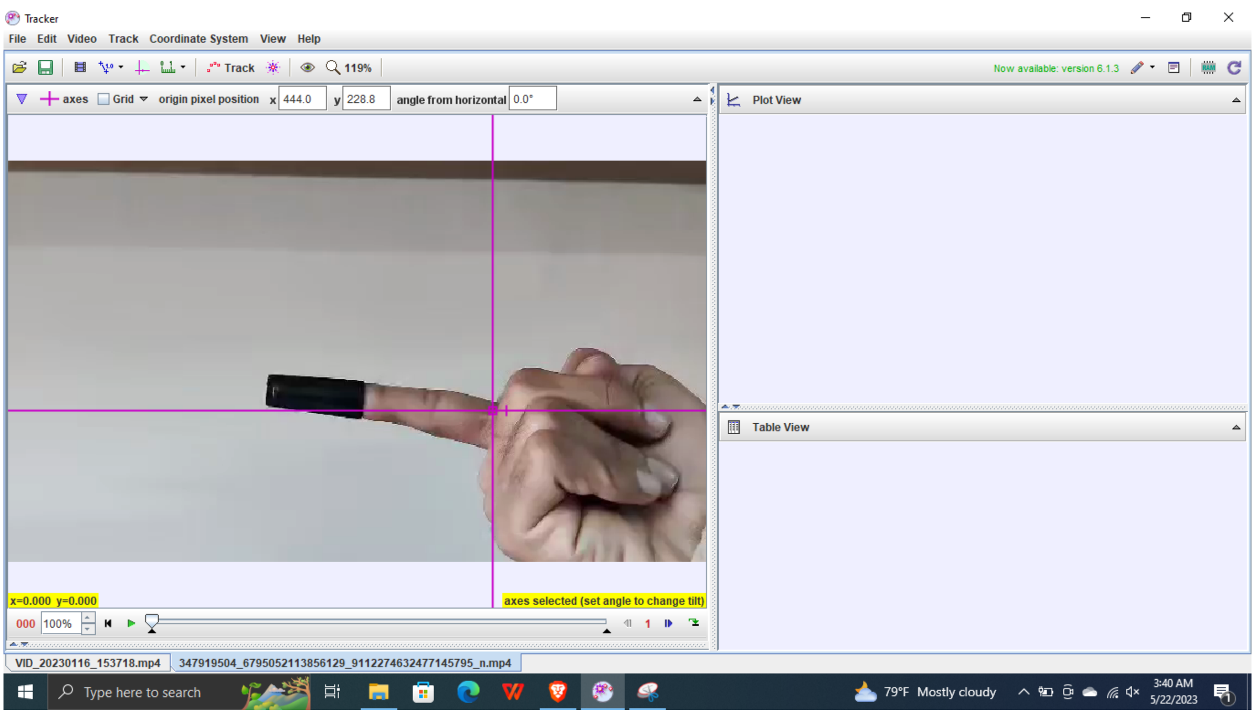
Motion analysis is also promising for the robotics industry. Robots can interact more naturally with their surroundings and carry out difficult tasks with greater accuracy and efficiency if they can comprehend and emulate human action. This has effects on the manufacturing, healthcare, and space exploration sectors.

Equipment:

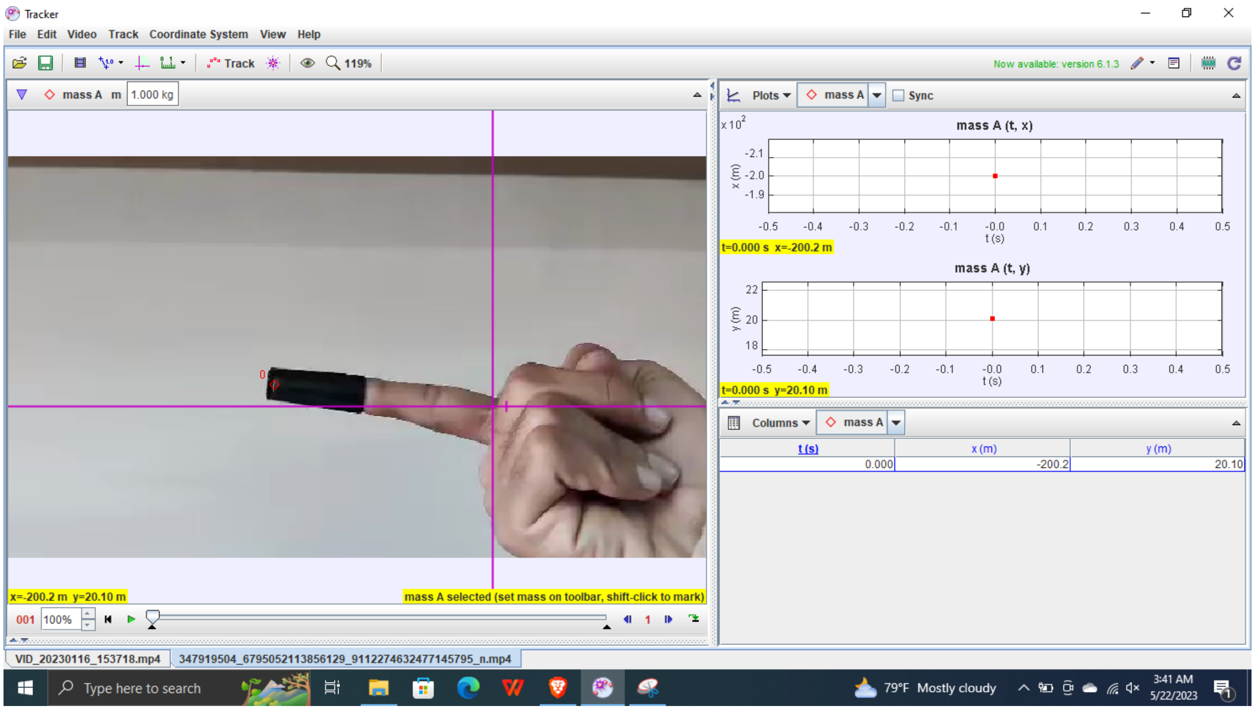
- Tracker Software
- Hand

Procedure:

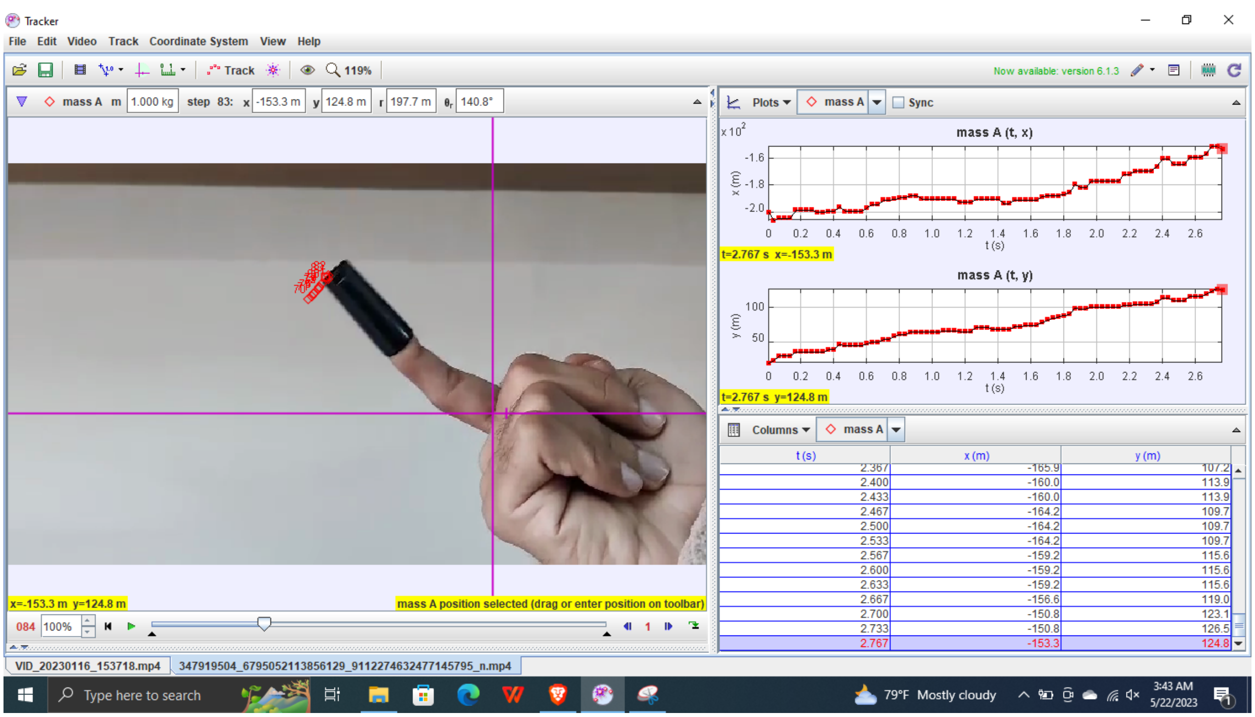
- Selection of origin in the video



- Point mass selection in the video



- Simulation of the selected points through the video



Result:

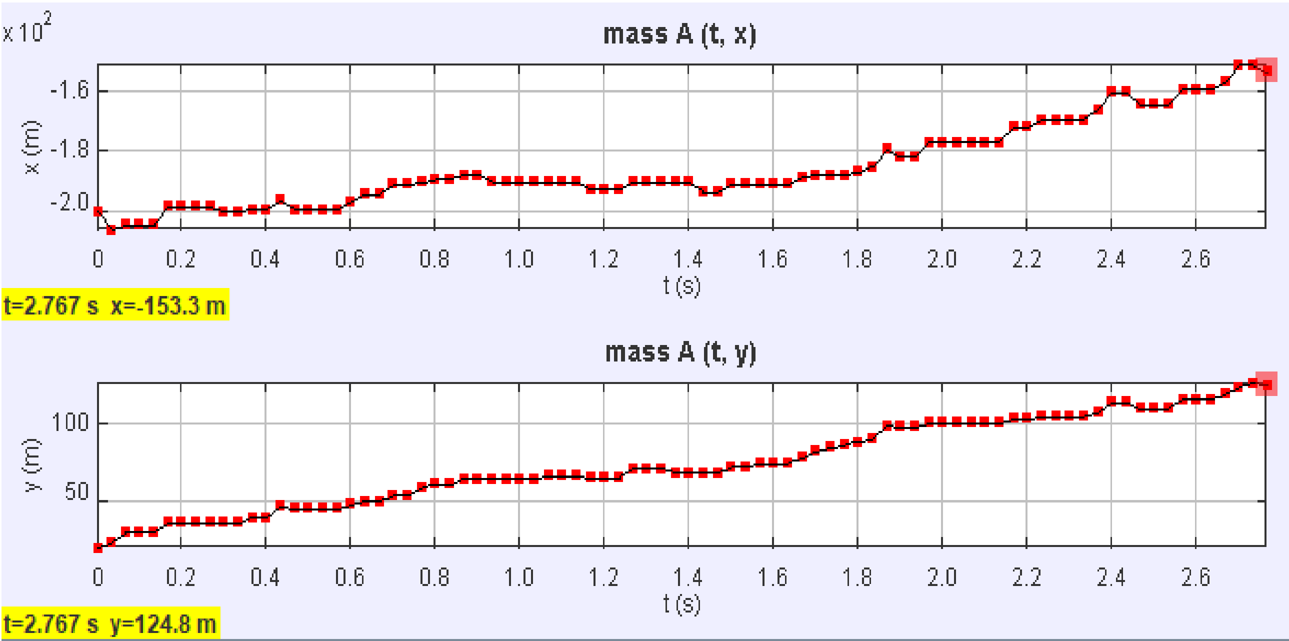


Table:

Time (s)	Xreal (cm)	Yreal (cm)	Xsoft (cm)	Ysoft (cm)	Vreal (cm/s)	Vsoft (cm/s)	Error (%)
0	-10.1	0	-9.9	1.52	-	-	-
0.297	-8.8	3.5	-9.06	3.76	0.107	0.118	10.56
1.758	-6.6	7.1	-7.17	6.08	0.028	0.022	20.22
3.884	-3.6	9.3	-4.17	8.38	0.017	0.019	9.56

Discussion:

In this experiment, we looked at how a finger moved utilizing various mass locations. We wanted to see how the motion would change when different masses were attached to the finger and how that change would show up in the motion graphs that resulted.

We processed and analyzed the motion data once it was captured in order to produce motion graphs. We could see any trends, changes, or discrepancies brought on by the various mass points by looking at these graphs, which presented visual representations of the finger's motion over time. The output graphs provided insightful information about how the finger's motion altered as mass points varied. We were able to pinpoint variables like acceleration, velocity, and displacement, which made it easier for us to comprehend how mass affected the finger's motion. In addition, we might identify any trends or relationships by comparing the graphs produced from several mass locations.

This experiment also creates new opportunities for investigation and study. It raises issues like how various mass distributions or the placement of mass points might affect how the finger moves. The results of this study may also guide the creation of prostheses, assistive technology, or rehabilitation methods that aim to improve or restore finger motion. Overall, this experiment contributes to our understanding of how mass affects finger motion and opens the door for future research that may have useful implications for a variety of domains involving human movement and manipulation.

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09.01.2022

Time (s)	X_{real} (cm)	Y_{real} (cm)	$X_{software}$ (cm)	$Y_{software}$ (cm)	V_{real} (cms^{-1})	$V_{software}$ (cms^{-1})	Error (%)
0	-10.1	0	-9.9	1.52	—	—	—
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