



Industrial Consultancy & Sponsored Research (IC&SR)

A MULTIMODAL 3-DEGREES OF FREEDOM HAPTIC DEVICE

IITM Technology Available for Licensing

PROBLEM STATEMENT

- **Haptics, the sense of touch, combines kinesthetic and tactile forces for human interaction in remote or virtual environments.**
- **Existing devices struggle to display tactile effects due to bulkiness and complexity.**
- **Researchers propose devices that can render stiffness with shape or texture but not both, but face limitations in resolution and workspace.**
- **Multi-fingered haptic interfaces are being developed to improve fidelity, workspace, and human adaptability, making them suitable for applications like rehabilitation, telesurgery, training, and gaming involving grasping, exploration, and manipulation.**

TECHNOLOGY CATEGORY MARKET

Technology: A Multimodal 3-degrees of Freedom Haptic Device

Category: Assistive, Test Equipment & Design Manufacturing/Robotics & Automation

Industry: Biomedical/Gaming/Automotive

Application: Haptic sensation /Remote environment

Market: The global market size is estimated to be worth **USD 3.9 billion in 2022** and is projected to reach **USD 5.0 billion by 2028**, at a **CAGR of 3.7%** during the forecast period.

INTELLECTUAL PROPERTY

IITM IDF Ref 1949 ,Patent No: IN 549191
PCT/IN2020/050903

TRL (Technology Readiness Level)

TRL- 4 Technology validated in lab

Research Lab

Prof.Asokan T,
Dept. of Engineering Design

TECHNOLOGY

- 1 • **A haptic device is a system that displays tactile sensations** based on contact force, consisting of a texture module, actuators, a position control module, and an impedance control module.
- 2 • **The texture module displays tactile sensations** based on a contact force, and the actuators simulate vibrations or shapes based on the selected texture and geometric shape.
- 3 • **The position control module creates a virtual environment with shape, shear, and texture**, while the impedance control module provides stiffness based on the contact force.
- 4 • **The device generates feedback based on stiffness, texture, shear, or shape.**
- 5 • **A grasper is a part of the device**, with a first and second segment with finger access, allowing the user to exert force on the textures.
- 6 • **The device also has a position control module and an impedance control module**, enabling the user to generate actions based on stiffness, texture, shear, or shape.

CONTACT US

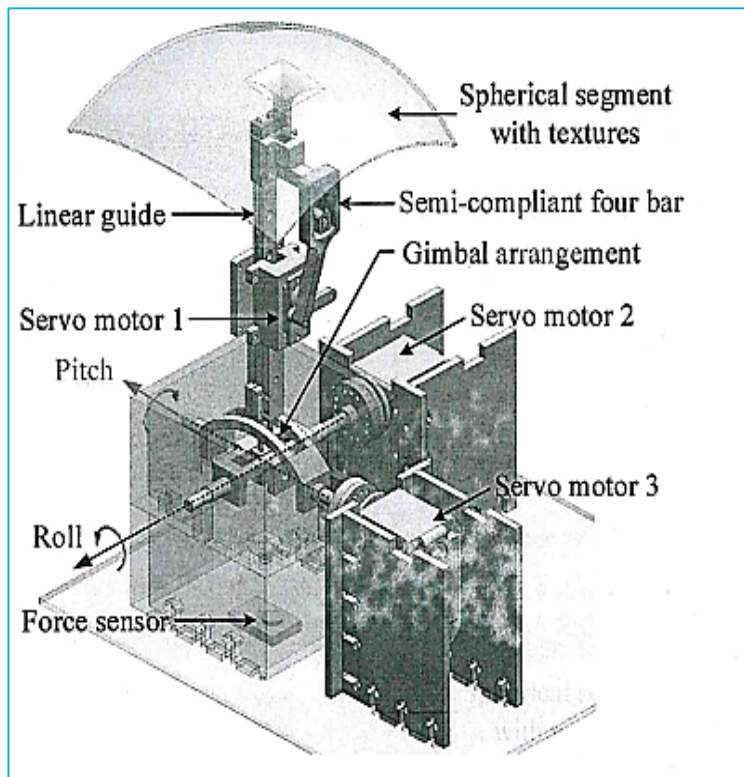
Dr. Dara Ajay, Head TTO
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
<https://ipm.icsr.in/ipm/>

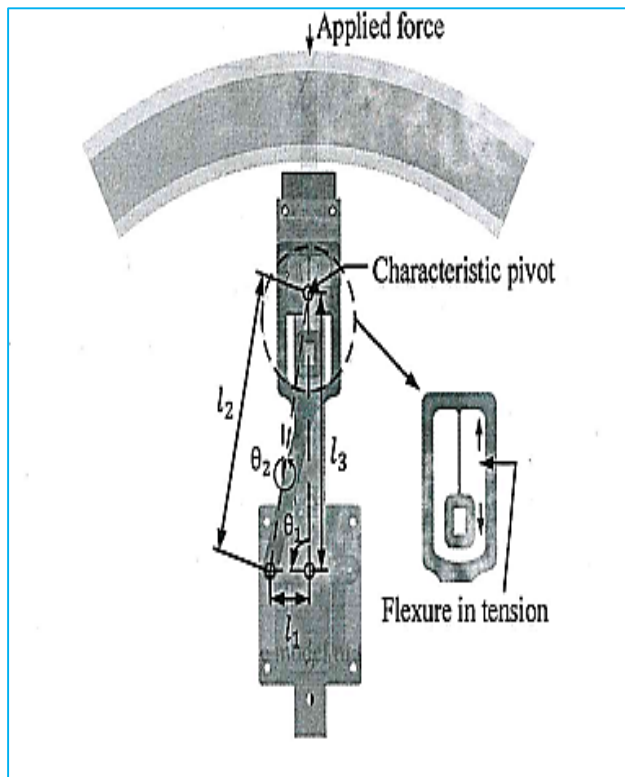
Email: headtto-icsr@icsrpis.iitm.ac.in
tto-mktg@icsrpis.iitm.ac.in

Phone: +91-44-2257 9756/ 9719

Complete model of the 3-DoF Haptic Device



Semi-compliant four-link mechanism

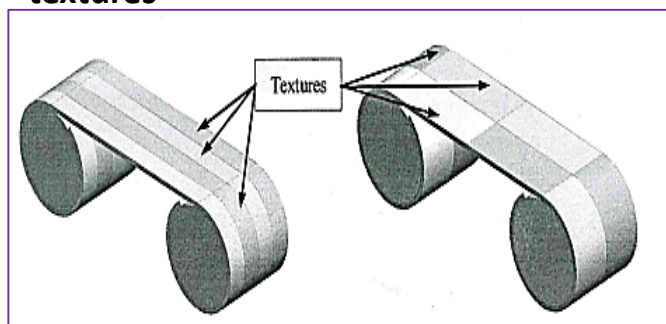


Key Features / Value Proposition

- **"Task Sensation Sensor"**
 - Includes grasper segment and texture module.
 - Spherical, connected to rollers.
- **Belt Division**
 - Belt divided into zones.
 - Vibro-actuators placed under texture module.
- **Position Control Module**
 - Includes gimbal arrangement for pitch and roll.
 - Includes linear guide and four-bar stiffness mechanism.
- **Texture Module**
 - Includes semicircular cylindrical drum.
 - Includes vibro-actuators for shape simulation.

- **Texture Module**
 - Includes first and second crowned rollers.
 - Includes drive roller.
 - Includes belt with textures.

CAD models of the design shows it has longer length & rapid switching for textures



CONTACT US

Dr. Dara Ajay, Head TTO
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
<https://ipm.icsr.in/ipm/>

Email: headtto-icsr@icsrpis.iitm.ac.in
tto-mktg@icsrpis.iitm.ac.in

Phone: +91-44-2257 9756/ 9719