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CBR Detail:

Sr. No.	App. Number	Ref. No./Application No.	Amount Paid	C.B.R. No.	Form Name	Remarks
1	202531070376	TEMP/E-1/78596/2025-KOL	2560	9243	FORM 1	AI SMART INJECTION PAD
2	E-106/2305/2025/KOL	202531070376	0	-----	FORM28	----
3	E-12/1419/2025/KOL	202531070376	2500	9243	FORM 9	----

TransactionID	Payment Mode	Challan Identification Number	Amount Paid	Head of A/C No
N-0001716567	Online Bank Transfer	2407250010621	5060.00	1475001020000001

Total Amount : ₹ 5060.00

Amount in Words: Rupees Five Thousand Sixty Only

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(12) PATENT APPLICATION PUBLICATION

(21) Application No.202531070376 A

(19) INDIA

(22) Date of filing of Application :24/07/2025

(43) Publication Date : 29/08/2025

(54) Title of the invention : AI SMART INJECTION PAD

(51) International classification :G09B0023280000, A61N0005060000, A61B0005026000, H02J0007000000, A61B0005149500

(86) International Application No :NA
Filing Date :NA

(87) International Publication No : NA

(61) Patent of Addition to Application Number :NA
Filing Date :NA

(62) Divisional to Application Number :NA
Filing Date :NA

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(57) Abstract :

The present invention relates to an artificial intelligence (AI)-powered smart injection training apparatus and a method for using the same comprising: an ergonomic housing and pad assembly, said pad assembly comprising a multi-layered structure simulating human anatomical layers including: (i) a synthetic epidermal layer made of soft-touch polymer with built-in finger grips and alignment markers; (ii) a subcutaneous simulation layer comprising silicone gel infused with microspheres and variable-density polyurethane foam; (iii) a muscular or vascular simulation layer made of flexible thermoplastic elastomer (TPE) embedded with synthetic tubing or conductive gel channels; a sensor array embedded beneath the pad surface, comprising: (i) pressure sensors to gauge tissue firmness; (ii) proximity sensors for detecting needle insertion angle and penetration depth; (iii) infrared or optical sensors to detect blood flow beneath the skin; a micro-actuated injection module comprising miniature motors configured to adjust needle angle between 30° and 90° and a depth limiter to prevent over-penetration; an onboard AI processing unit comprising an ARM-class microcontroller and a neural accelerator; a user interface comprising an LED ring and a haptic motor configured to provide real-time guidance; a wireless communication module configured to via Bluetooth or Wi-Fi; and a rechargeable battery with Qi-wireless charging and safety interlocks that halt needle insertion if sensors detect undue resistance or blood.

No. of Pages : 15 No. of Claims : 13

FIELD OF THE INVENTION

The present invention relates to a medical training devices, and more particularly to a smart injection training apparatus. Specifically, the invention pertains to an artificial intelligence (AI) enabled injection pad designed to simulate realistic injection scenarios and provide real-time, sensor-based feedback to users. The invention is applicable in clinical and educational settings for training in venipuncture, intramuscular, subcutaneous, and other injection techniques, thereby improving procedural accuracy, skill acquisition, and user competency through intelligent assessment and feedback systems.

BACKGROUND OF THE INVENTION

Administering injections and performing venipunctures are among the most fundamental and frequently performed procedures in clinical practice. Proficiency in these techniques is essential for medical professionals, including medical students, newly practicing physicians, nurses, and paramedics. These procedures involve the insertion of a needle into a specific tissue plane, often with the goal of accessing vascular structures, delivering medications, or withdrawing fluids. Due to their frequency and clinical importance, healthcare practitioners are expected to master these skills early in their training.

Despite their ubiquity, achieving technical proficiency in injection and venipuncture procedures remains a significant challenge for medical students, nursing trainees, and even newly qualified healthcare professionals. Proper needle insertion technique requires an accurate understanding of anatomical structures, appropriate control of the insertion angle and depth, and a delicate tactile response to tissue resistance. Mistakes such as improper angle, excessive pressure, insufficient depth or failure to locate a vein can result in a range of adverse outcomes, including bruising, hematoma formation, nerve injury, infection and patient discomfort. Such experiences can negatively impact the confidence and competence of trainees.

Traditional training methodologies often involve the use of simple silicone or rubber pads, low-fidelity mannequins or live patient interaction under

supervision. While these methods may offer basic familiarity with the procedure, they are inherently limited in their ability to objectively assess performance or provide real-time feedback. These tools do not typically measure or evaluate the accuracy of parameters critical to safe and effective injections such as the needle insertion angle, penetration depth or targeting precision relative to anatomical features.

Furthermore, in live patient scenarios, the presence of a supervising clinical professional may introduce pressure or anxiety, while ethical considerations restrict repeated practice. Moreover, the absence of an objective data-driven assessment hinders the ability of educators to track progress, tailor instruction or pinpoint specific areas of weakness in a trainee's technique. As a result, learning often occurs through a subjective, trial-and-error process that can be inefficient, error-prone, and inconsistent across training institutions.

Recent advancements in sensor technology and artificial intelligence (AI) have enabled new capabilities in simulation-based learning and procedural training. AI-driven systems have shown promise in providing real-time monitoring, predictive analytics, and feedback mechanisms in fields such as robotic surgery and physiotherapy. However, the application of these technologies to needle-based procedures—particularly injection and venipuncture training—remains limited.

Existing simulators may incorporate some degree of tactile realism but generally do not capture or analyse key performance metrics such as needle insertion angle, depth, pressure or targeting accuracy. Furthermore, they lack adaptive feedback systems that can guide the user toward improved technique based on objective performance data.

Accordingly, there exists a need for an intelligent, sensor-integrated training system that can provide high-fidelity simulation along with real-time, data-driven feedback on needle-based procedures. Such a system would enhance clinical training outcomes, reduce procedural errors, and bridge the gap between theoretical instruction and practical competency.

OBJECTIVE OF THE INVENTION

The principal objective of the present invention is to provide an advanced, Artificial Intelligence (AI)-enabled smart injection training apparatus configured to assist medical professionals and trainees in mastering injection techniques through a realistic simulation platform. The invention addresses the limitations of conventional injection training models by integrating a multi-layered anatomical simulation pad with sensor arrays, automated needle control, and intelligent feedback systems. The apparatus is further adapted to detect, analyze, and correct user injection parameters such as needle angle, insertion depth, and applied pressure in real time. Through its embedded AI processing capabilities and responsive user interface, the apparatus aims to minimize user error, enhance procedural accuracy, and improve learning efficiency in clinical and educational environments.

The objective of the invention is also to provide a method for using AI-enabled smart injection training apparatus as claimed in claim 1, comprising the steps of: positioning the apparatus on a training surface; inserting a needle into the pad assembly, wherein the sensor array captures data on insertion angle, depth, pressure, and targeting precision; processing the captured data through the AI processing unit to evaluate injection technique against pre-trained machine learning models; generating real-time feedback through the user interface, including visual, tactile, or auditory cues; adjusting needle angle and penetration depth via the micro-actuated injection module based on AI predictions; synchronizing performance data with a companion application via wireless communication for remote monitoring and analysis; wherein the method improves procedural accuracy, skill acquisition, and user competency through sensor-based feedback.

SUMMARY OF THE INVENTION

The present invention provides an AI-driven smart injection training apparatus comprising an ergonomically designed housing and a multilayered synthetic pad assembly that replicates human anatomical structures, including epidermal, subcutaneous, muscular, and vascular components.

The pad assembly is composed of materials selected to simulate the tactile response of biological tissues and is embedded with a sensor array comprising pressure sensors, proximity sensors, and optical or infrared sensors configured to monitor user interaction during needle insertion.

The apparatus further includes a micro-actuated injection module, wherein miniature actuators dynamically adjust the needle's angle, depth, and insertion speed in response to real-time sensor data. An onboard AI processing unit, comprising a microcontroller and neural accelerator, is operable to process data inputs from the sensor array and evaluate injection technique against pre-defined diagnostic thresholds. The AI system is configured to detect procedural deviations including but not limited to shallow insertion, misalignment, and excessive force, and to generate immediate corrective feedback via an integrated user interface comprising LED indicators, haptic motors, and/or auditory alerts.

The apparatus also comprises a wireless communication module operable via Bluetooth or Wi-Fi to enable synchronization with external devices including mobile or desktop applications. Such integration facilitates performance tracking, remote supervision by instructors, and individualized training feedback. Furthermore, the device includes safety interlocks that restrict needle advancement upon detection of abnormal resistance or simulated vascular penetration, thereby enhancing user safety.

The invention additionally encompasses a method for utilizing the apparatus, the method comprising the steps of positioning the apparatus, performing a needle insertion, capturing real-time sensor data, processing said data through the AI unit, providing responsive feedback to the user, dynamically adjusting the needle through actuation, and synchronizing usage data with external systems. The method enables procedural refinement through interactive, data-driven training and is adaptable to simulate diverse patient profiles and injection scenarios.

BRIEF DESCRIPTION OF DRAWINGS

1. Ergonomic Housing & Pad Surface

- Soft-touch polymer to conform to skin contours
- Built-in finger grips and alignment markers

2. **Sensor Array**

- Pressure sensors to gauge tissue firmness
- Infrared/optical sensors to detect blood-flow beneath the skin
- Proximity sensors for consistent pad placement

3. **Micro-Actuated Injection Module**

- Miniature motor adjusts needle angle (e.g., 30°–90°)
- Depth limiter to prevent over-penetration

4. **AI Processing Unit**

- Onboard computer (e.g., ARM-class MCU + neural accelerator)
- Pre-trained ML models to classify tissue type and recommend dose site

5. **User Interface & Connectivity**

- LED ring and haptic motor for real-time guidance
- Bluetooth/Wi-Fi to sync with smartphone app or hospital network

6. **Power & Safety**

- Rechargeable battery with Qi-wireless charging
- Interlocks that halt needle insertion if sensors detect undue resistance or blood

DETAILED DESCRIPTION OF INVENTION

The present invention provides a sophisticated artificial intelligence (AI)-powered smart injection pad designed to serve as an advanced training apparatus for medical professionals and students. The device is engineered to simulate realistic human anatomical conditions during injection-based procedures and to deliver intelligent, real-time feedback to enhance learning, precision, and procedural consistency.

The AI Smart Injection Pad is a cutting-edge, ergonomically designed medical device that employs artificial intelligence and sensor-driven automation to transform the administration of subcutaneous injections. Unlike conventional manual techniques, this intelligent system integrates a network of pressure sensors, infrared and optical detectors, and proximity sensors to detect optimal injection sites, assess underlying tissue characteristics, and ensure precise needle placement with every use.

The pad's surface is constructed from a soft-touch, skin-like polymer that conforms comfortably to the patient's body, enhancing both usability and realism. Built-in finger grips and alignment markers further support correct positioning, reducing the risk of user error. This makes the device especially valuable for individuals who require frequent injections—such as patients managing diabetes—as well as healthcare professionals seeking to improve injection accuracy and minimize procedural variability.

At the heart of the device lies a micro-actuated injection module, capable of dynamically adjusting the needle's angle (ranging from 30° to 90°) and penetration depth based on continuous real-time sensor input. The onboard AI engine—supported by a dedicated neural processing unit—runs pre-trained machine learning models to classify tissue types and recommend ideal injection sites.

Users are guided throughout the procedure via visual indicators and haptic feedback, ensuring safe and effective injections. The device supports Bluetooth and Wi-Fi connectivity, enabling seamless data synchronization with companion applications, electronic health records (EHRs), and remote monitoring systems.

To ensure safety and convenience, the AI Smart Injection Pad incorporates integrated safety interlocks and Qi-enabled wireless charging, offering a secure, portable, and maintenance-friendly design. This combination of intelligent automation, realistic simulation, and digital connectivity represents a significant advancement in both patient self-care and clinical training environments.

The specific components of the device are detailed as under:

1. Ergonomic Housing and Pad Assembly

The AI Smart Injection Pad features an ergonomically contoured outer casing topped with a high-fidelity pad surface. The casing is made from advanced polymer or composite materials designed to closely mimic the look and feel of human skin and underlying tissue. The pad surface is composed of the following simulated anatomical layers:

- A synthetic epidermal layer comprising of a soft-touch polymer, engineered to replicate the texture, elasticity, and responsiveness of human skin that comprise built-in finger grips and aligned markers.
- A subcutaneous simulation layer, comprising silicone gel infused with microspheres and variable-density polyurethane foam of varied density to emulate adipose and connective tissues.
- A muscular or vascular simulation layer made of flexible thermoplastic elastomer (TPE) embedded with synthetic tubing or conductive gel channels to simulate veins or muscular tissue, depending on the training mode.

These layered structure is meticulously designed to mimicking the real-life skin and tissue of human are carefully designed to be accurately used for training variety of injection being simulated (e.g., intravenous, intramuscular, subcutaneous).

2. Sensor Array and Data Acquisition

Beneath the pad surface is embedded a high-density sensor matrix, configured to monitor a range of biomechanical parameters during a needle insertion event. This matrix comprises:

- **Pressure sensors** that measure applied force distribution and contact intensity which can gauge tissue firmness — capacitive and piezoresistive pressure sensors are used for accurate force mapping.
- **Proximity sensors** to detect needle insertion angle and penetration depth which provide consistent pad placement — time-of-flight (ToF) optical proximity sensors or capacitive proximity sensors are employed to ensure precise spatial recognition.
- **Optical or infrared (IR) sensors**, which assist in determining insertion depth, detect blood flow beneath the skin, breaches of simulated vessels, and monitor ambient interaction parameters.

The sensors collaboratively collect data points is configured to capture critical information which can provide information regarding the insertion angle, the penetration depth, and the targeting precision during needle insertion.

3. AI-Powered Feedback and Processing Module

The collected sensor data is processed by an onboard AI processing unit integrated into the device housing. This unit comprises:

- The unit is equipped with a compact yet powerful onboard computer like ARM-class MCU + neural accelerator that runs machine learning models specifically trained to distinguish between optimal and suboptimal injection techniques and dosage types. By processing real-time input data from the sensor array, the AI engine evaluates the trainee's performance and delivers immediate, targeted feedback. This enables a highly personalized, adaptive, and progressive learning experience tailored to each user's skill level.
- A rule-based engine that maps sensor data to diagnostic outcomes (e.g., "shallow insertion," "misaligned entry," or "excessive force applied").

The AI system evaluates real-time needle behaviour against stored reference patterns and issues personalized feedback, which may be descriptive (text-based), visual, auditory, or tactile in nature.

4. Micro-Actuated Injection Simulation Module

At the core of the training simulation lies the **micro-actuated injection module**, a highly advanced system designed to replicate the tactile nuances of real-world injections. Powered by precision micro-motors and actuators, this module actively controls needle angle (30 – 90 degrees) depth, insertion speed, and resistance levels. It responds dynamically to real-time predictions and assessments generated by the onboard AI models, which are trained to simulate a wide range of physiological conditions.

This intelligent feedback loop enables the system to simulate varying levels of tissue resistance, accurately mimicking the feel of different anatomical structures such as soft adipose tissue, dense muscular areas, or fragile vascular regions. As a result, trainees are exposed to realistic injection scenarios that replicate diverse patient profiles, including variations in muscle tone, subcutaneous fat distribution, and vein sensitivity. This enhances not only technical accuracy but also clinical preparedness for complex, real-life situations.

5. Multi-Modal Feedback Interface

The user interface is designed to deliver intuitive, multi-sensory feedback through a combination of LED indicators, haptic vibration motors, and integrated wireless communication modules (such as Bluetooth and Wi-Fi). Visual cues provided by the LEDs indicate the accuracy and correctness of the injection in real time, while the haptic feedback delivers immediate tactile responses like vibrations or pulse which alert users to errors in technique, including incorrect depth, angle, or pressure.

6. Wireless communications

In addition, the system seamlessly connects to a companion mobile or desktop application via wireless communication. This app not only delivers detailed performance summaries and corrective suggestions to the trainee but also enables instructors or supervisors to remotely monitor, record, and analyze each training session. The combination of immediate, multimodal feedback and remote connectivity enhances both independent learning and supervised instruction, making the platform highly effective for skill development and assessment.

6. Power Supply and Safety Mechanisms

The device is powered by a rechargeable Qi battery system equipped with integrated safety interlocks to ensure secure, reliable, and uninterrupted operation. Designed for portability and extended use, the battery supports long training sessions without frequent recharging. The built-in safety mechanisms protect against overcharging, overheating, and short circuits, making the device both safe and user-friendly in clinical and educational environments.

Overall, the AI Smart Injection Pad seamlessly integrates advanced sensing technologies, intelligent data processing, dynamic anatomical simulation, and robust wireless connectivity to deliver a transformative solution for clinical skills training. This comprehensive system represents a significant leap forward in medical education, offering realistic practice, real-time feedback, and data-driven performance enhancement in a single, portable platform.

We claim:

1. An artificial intelligence (AI)-powered smart injection training apparatus comprising:
 - a) an ergonomic housing and pad assembly, said pad assembly comprising a multi-layered structure simulating human anatomical layers including:
 - i) a synthetic epidermal layer made of soft-touch polymer with built-in finger grips and alignment markers;
 - ii) a subcutaneous simulation layer comprising silicone gel infused with microspheres and variable-density polyurethane foam;
 - iii) a muscular or vascular simulation layer made of flexible thermoplastic elastomer (TPE) embedded with synthetic tubing or conductive gel channels;
 - b) a sensor array embedded beneath the pad surface, comprising:
 - i) pressure sensors to gauge tissue firmness;
 - ii) proximity sensors for detecting needle insertion angle and penetration depth;
 - iii) infrared or optical sensors to detect blood flow beneath the skin;
 - c) a micro-actuated injection module comprising miniature motors configured to adjust needle angle between 30° and 90° and a depth limiter to prevent over-penetration;
 - d) an onboard AI processing unit comprising an ARM-class microcontroller and a neural accelerator;
 - e) a user interface comprising an LED ring and a haptic motor configured to provide real-time guidance;
 - f) a wireless communication module configured to via Bluetooth or Wi-Fi; and
 - g) a rechargeable battery with Qi-wireless charging and safety interlocks that halt needle insertion if sensors detect undue resistance or blood.
2. The apparatus as claimed in claim 1, wherein the pressure sensors include capacitive and piezoresistive sensors.

3. The apparatus as claimed in claim 1, wherein the proximity sensors include time-of-flight (ToF) optical or capacitive sensors.
4. The apparatus as claimed in claim 1, wherein the AI processing unit includes a rule-based engine to map sensor data to diagnostic outcomes, including shallow insertion, misaligned entry, or excessive force, and provide descriptive, visual, auditory, or tactile feedback.
5. The apparatus as claimed in claim 1, wherein the micro-actuated injection module dynamically adjusts needle angle, insertion speed, and resistance to simulate varying tissue types, including adipose, muscular, or vascular regions.
6. The apparatus as claimed in claim 1, wherein the wireless communication modules enable data synchronization with a companion mobile or desktop application for remote monitoring and performance analysis.
7. The apparatus as claimed in claim 1, wherein the multi-layered pad assembly is designed to mimic human skin and tissue for training in intravenous, intramuscular, or subcutaneous injections.
8. The apparatus as claimed in claim 1, wherein the user interface provides real-time visual cues via LED indicators for injection accuracy and tactile alerts via haptic motors for errors in technique.
9. The apparatus as claimed in claim 1, wherein the safety interlocks prevent needle insertion upon detecting undue resistance or simulated blood flow breaches.
10. The apparatus as claimed in claim 1, wherein the wireless communication module enables performance summaries, corrective suggestions, and remote monitoring by instructors or supervisors.
11. A method for using AI-enabled smart injection training apparatus as claimed in claim 1, comprising the steps of:
 - a) positioning the apparatus on a training surface;
 - b) inserting a needle into the pad assembly, wherein the sensor array captures data on insertion angle, depth, pressure, and targeting precision;

- c) processing the captured data through the AI processing unit to evaluate injection technique against pre-trained machine learning models;
 - d) generating real-time feedback through the user interface, including visual, tactile, or auditory cues;
 - e) adjusting needle angle and penetration depth via the micro-actuated injection module based on AI predictions;
 - f) synchronizing performance data with a companion application via wireless communication for remote monitoring and analysis; wherein the method improves procedural accuracy, skill acquisition, and user competency through sensor-based feedback.
12. The method as claimed in claim 10, wherein the feedback includes diagnostic outcomes such as shallow insertion, misaligned entry, or excessive force, tailored to the user's performance.
13. The method as claimed in claim 10, wherein the apparatus simulates varying patient profiles by adjusting the multi-layered pad assembly and micro-actuated injection module to replicate differences in tissue resistance and anatomical structures.

Dated this 23rd day of July 2025



Sudarshana Bandyopadhyay

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ABSTRACT

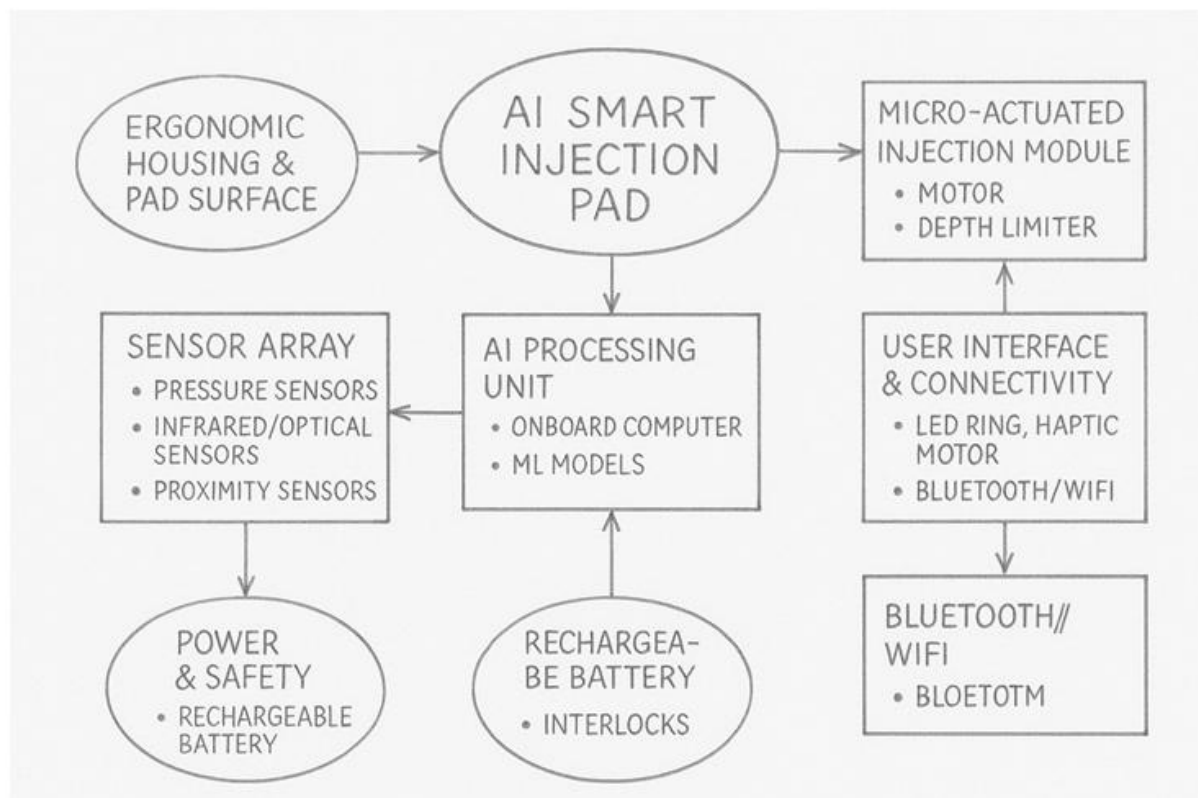
AI SMART INJECTION PAD

The present invention relates to an artificial intelligence (AI)-powered smart injection training apparatus and a method for using the same comprising: an ergonomic housing and pad assembly, said pad assembly comprising a multi-layered structure simulating human anatomical layers including: (i) a synthetic epidermal layer made of soft-touch polymer with built-in finger grips and alignment markers; (ii) a subcutaneous simulation layer comprising silicone gel infused with microspheres and variable-density polyurethane foam; (iii) a muscular or vascular simulation layer made of flexible thermoplastic elastomer (TPE) embedded with synthetic tubing or conductive gel channels; a sensor array embedded beneath the pad surface, comprising: (i) pressure sensors to gauge tissue firmness; (ii) proximity sensors for detecting needle insertion angle and penetration depth; (iii) infrared or optical sensors to detect blood flow beneath the skin; a micro-actuated injection module comprising miniature motors configured to adjust needle angle between 30° and 90° and a depth limiter to prevent over-penetration; an onboard AI processing unit comprising an ARM-class microcontroller and a neural accelerator; a user interface comprising an LED ring and a haptic motor configured to provide real-time guidance; a wireless communication module configured to via Bluetooth or Wi-Fi; and a rechargeable battery with Qi-wireless charging and safety interlocks that halt needle insertion if sensors detect undue resistance or blood.

Appl No. -

Sheet 1 of 1

Figure 1



Sudarshana

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Agent for the Applicants

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Name: Sudarshana
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FORM 5
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003

Declaration as to Inventorship
[See section 10(6) and rule 13(6)]

1. NAME OF APPLICANT: SRJX RESEARCH AND INNOVATION LAB LLP,

hereby declare that the true and first inventor(s) of the invention disclosed in the complete specification filed in pursuance of our application numbered _____ dated _____ are:

2. INVENTORS:

- I.**
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 - b) Nationality: An Indian National
 - b) c) Address: Plot No - 3E/474, Sector-9, CDA, Post- Markat Nagar, Cuttack-753014, Odisha, India
- II.**
- a) Name: **MR SANJOY SAHA**
 - c) Nationality: An Indian National
 - d) Address: 63/1, Thakur Para Road, P.O.- Naihati, North 24 Parganas, West Bengal-743165, India

Dated this 23rd day of July 2025



Name of the signatory:

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Dated this 23rd day of July 2025

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Email: bandyopadhyay.sudarshana@gmail.com
Phn No: 9748818235

To,
The Controller of Patents,
The Patent Office
At Kolkata

CERTIFICATE NO:
DIPP203406



सत्यमेव जयते
Government of India
Ministry of Commerce & Industry
Department for Promotion of Industry and Internal Trade

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CERTIFICATE OF RECOGNITION

This is to certify that **SRJX RESEARCH AND INNOVATION LAB LLP** incorporated as a **Limited Liability Partnership** on **05-05-2025**, is recognized as a startup by the Department for Promotion of Industry and Internal Trade. The startup is working in 'Professional & Commercial Services' Industry and 'Professional Information Services' sector as self-certified by them.

This certificate shall only be valid for the Entity up to **Ten** years from the date of its incorporation only if its turnover for any of the financial years has not extended ₹ **100 Cr.**

14-05-2025

DATE OF ISSUE



04-05-2035

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Name: Sudarshan
Bandyopadhyay
Date: 23-Jul-2024 23:01:23
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FORM 28 THE PATENTS ACT, 1970 (39 of 1970) AND THE PATENTS RULES, 2003 TO BE SUBMITTED BY A SMALL ENTITY /STARTUP/EDUCATIONAL INSTITUTION [See rules 2 (fa), 2(fb), 2(ca) and 7]		
1	Name, address and nationality.	We, SRJX RESEARCH AND INNOVATION LAB LLP, of the address Plot No - 3E/474, Sector-9, CDA, Post- Markat Nagar, Cuttack-753014, Odisha, India, applicant in respect of the patent application no. _____ dated 23 July 2025 hereby declare that we are a small entity in accordance with rule 2(fa) and submit the following document as a proof :
2	Documents to be submitted	
	i. For claiming the status of a small entity:	
	A. For an Indian applicant: Evidence of registration under the Micro, Small and Medium Enterprises Act, 2006 (27 of 2006).	
3	To be signed by the applicant(s) / patentee (s) / authorised registered patent agent.	The information provided herein is correct to the best of my/our knowledge and belief. Dated this 23rd day of July 2025
4	Name of the natural person who has signed.	Signature: 

Signature Not Verified

Digitally Signed.
 Name: Sudarshana
 Bandyopadhyay
 Date: 23-Jul-2023 22:57:04
 Reason: Patent Filing

	Designation and official seal, if any, of the person who has signed.	Sudarshana Bandyopadhyay Regn. No.: IN/PA 2802 Agent for the applicant Phn No. 9748818235 Email: bandyopadhyay.sudarshana@gmail.com To The Controller of Patents, The Patent Office, At Kolkata
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"FORM 1 THE PATENTS ACT 1970 (39 of 1970) and THE PATENTS RULES, 2003 APPLICATION FOR GRANT OF PATENT (See section 7, 54 and 135 and sub-rule (1) of rule 20)				(FOR OFFICE USE ONLY)	
				Application No.	
				Filing date:	
				Amount of Fee paid:	
				CBR No:	
				Signature:	
1. APPLICANT'S REFERENCE / IDENTIFICATION NO. (AS ALLOTTED BY OFFICE)					
2. TYPE OF APPLICATION [Please tick (✓) at the appropriate category]					
Ordinary (✓)		Convention ()		PCT-NP ()	
Divisional ()	Patent of Addition ()	Divisional ()	Patent of Addition ()	Divisional ()	Patent of Addition ()
3A. APPLICANT(S)					
Name in Full		Nationality	Country of Residence	Address of the Applicant	
SRJX RESEARCH AND INNOVATION LAB LLP		Indian	India	SRJX RESEARCH AND INNOVATION LAB LLP, Plot No - 3E/474, Sector-9, CDA, Post- Markat Nagar, Cuttack- 753014, Odisha, India	
3B. CATEGORY OF APPLICANT [Please tick (✓) at the appropriate category]					
Natural Person ()		Other than Natural Person			
		Small Entity ()	Startup (✓)	Others ()	
4. INVENTOR(S) [Please tick (✓) at the appropriate category]					
Are all the inventor(s) same as the applicant(s) named above?		Yes ()		No (✓)	

If “No”, furnish the details of the inventor(s)					
Name in Full		Nationality	Country of Residence	Address of the Inventor	
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MR SANJOY SAHA		Indian	India	63/1, Thakur Para Road, P.O.- Naihati, North 24 Parganas, West Bengal-743165, India	
5. TITLE OF THE INVENTION					
AI SMART INJECTION PAD					
6. AUTHORISED REGISTERED PATENT AGENT(S)			IN/PA No.	2802	
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			Fax No.	NA	
			E-mail ID	bandyopadhyay.sudarshana@gmail.com	
8. IN CASE OF APPLICATION CLAIMING PRIORITY OF APPLICATION FILED IN CONVENTION COUNTRY, PARTICULARS OF CONVENTION APPLICATION					
Country	Application Number	Filing date	Name of the applicant	Title of the invention	IPC (as classified in the convention country)
N.A.					

9. IN CASE OF PCT NATIONAL PHASE APPLICATION, PARTICULARS OF INTERNATIONAL APPLICATION FILED UNDER PATENT CO-OPERATION TREATY (PCT)	
International application number	International filing date
10. IN CASE OF DIVISIONAL APPLICATION FILED UNDER SECTION 16, PARTICULARS OF ORIGINAL (FIRST) APPLICATION	
Original (first) application No.	Date of filing of original (first) application
N.A.	
11. IN CASE OF PATENT OF ADDITION FILED UNDER SECTION 54, PARTICULARS OF MAIN	
Main application/patent No.	Date of filing of main application
N.A.	N.A.
12. DECLARATIONS	
(i) Declaration by the inventor(s) (In case the applicant is an assignee: the inventor(s) may sign herein below or the applicant may upload the assignment or enclose the assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period). We, the above-named inventor(s) is/are the true & first inventor(s) for this Invention and declare that the applicant(s) herein is/are my/our assignee or legal representative. (a) Date: (b) Signature: (c) Name: Mr Soumya Ranjan Jena (a) Date (b) Signature(s): (c) Name: Mr Sanjoy Saha	

(ii) Declaration by the applicant(s) in the convention country

(In case the applicant in India is different than the applicant in the convention country: the applicant in the convention country may sign herein below or applicant in India may upload the assignment from the applicant in the convention country or enclose the said assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period)

I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative. – **N.A.**

- (a) Date
- (b) Signature(s)
- (c) Name(s) of the signatory

(iii) Declaration by the applicant

We the applicant hereby declare that: -

- ☒ We are in possession of the above-mentioned invention.
- ☒ The complete specification relating to the invention is filed with this application.
- ☐ The invention as disclosed in the specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us.
- ☒ There is no lawful ground of objection(s) to the grant of the Patent to us.
- ☐ We are the true & first inventor(s).
- ☒ We are the assignee or legal representative of true & first inventor(s).
- ☐ The application or each of the applications, particulars of which are given in Paragraph-8, was the first application in convention country in respect of my invention(s).
- ☐ We claim the priority from the above mentioned application(s) filed in convention country/countries and state that no application for protection in respect of the invention had been made in a convention country before that date by us or by any person from which I derive the title.
- ☐ Our application in India is based on international application under Patent Cooperation Treaty (PCT) as mentioned in Paragraph-9.
- ☐ The application is divided out of my /our application particulars of which is given in Paragraph-10 and pray that this application may be treated as deemed to have been filed on DD/MM/YYYY under section 16 of the Act.
- ☐ The said invention is an improvement in or modification of the invention particulars of which are given in Paragraph-11.

13. FOLLOWING ARE THE ATTACHMENTS WITH THE APPLICATION

(a) Form 2

<i>Item</i>	<i>Details</i>	<i>Fee</i>	<i>Remarks</i>
Complete/ provisional specification	No. of pages: 15	1600	Including Form 2, description, claims, abstract and drawings
No. of Claim(s)	No. of Claims = 13 No. of Pages = 3	320 x 3	3 extra claims
Abstract	1		
No. of Drawing(s)	No. of drawings = 1 and No. of pages = 1		

In case of a complete specification, if the applicant desires to adopt the drawings filed with his provisional specification as the drawings or part of the drawings for the complete specification under rule 13(4), the number of such pages filed with the provisional specification are required to be mentioned here.

- b. Form 3: Statement and Undertaking
- c. Form 5: Declaration as to inventorship
- d. Power of Attorney
- e. Form 28
- f. Form 9

Total fee ₹ 5060/- is being paid online through electronic portal

We hereby declare that to the best of our knowledge, information and belief the fact and matters stated herein are correct and we request that a patent may be granted to us for the said invention.

Dated this day 23rd of July 2025.

Signature:



Name: Sudarshana Bandyopadhyay

(Regn No: IN/PA 2802)

Agent for the Applicant

Phn no.: 97488 18235

email: bandyopadhyay.sudarshana@gmail.com

To,
The Controller of Patents
The Patent Office,
at Kolkata

FORM 28 THE PATENTS ACT, 1970 (39 of 1970) AND THE PATENTS RULES, 2003 TO BE SUBMITTED BY A SMALL ENTITY /STARTUP/EDUCATIONAL INSTITUTION [See rules 2 (fa), 2(fb), 2(ca) and 7]		
1	Name, address and nationality.	We, SRJX RESEARCH AND INNOVATION LAB LLP, of the address Plot No - 3E/474, Sector-9, CDA, Post- Markat Nagar, Cuttack-753014, Odisha, India, applicant in respect of the patent application no. _____ dated 23 July 2025 hereby declare that we are a small entity in accordance with rule 2(fa) and submit the following document as a proof :
2	Documents to be submitted	
	i. For claiming the status of a small entity:	
	A. For an Indian applicant: Evidence of registration under the Micro, Small and Medium Enterprises Act, 2006 (27 of 2006).	
3	To be signed by the applicant(s) / patentee (s) / authorised registered patent agent.	The information provided herein is correct to the best of my/our knowledge and belief. Dated this 23rd day of July 2025
4	Name of the natural person who has signed.	Signature: 

Signature Not Verified

Digitally Signed.
 Name: Sudarshana
 Bandyopadhyay
 Date: 23-Jul-2023 22:57:04
 Reason: Patent Filing

	Designation and official seal, if any, of the person who has signed.	Sudarshana Bandyopadhyay Regn. No.: IN/PA 2802 Agent for the applicant Phn No. 9748818235 Email: bandyopadhyay.sudarshana@gmail.com To The Controller of Patents, The Patent Office, At Kolkata
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FORM 9
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
REQUEST FOR PUBLICATION
[See Section 11A(2); Rule 24A]

We, SRJX RESEARCH AND INNOVATION LAB LLP, of the address Plot No - 3E/474, Sector-9, CDA, Post- Markat Nagar, Cuttack-753014, Odisha, India, hereby request for an early publication of our Patent Application No. _____ filed on 23 July 2025 under Section 11A(2) of the Act.

Dated this 23rd day of July 2025



Sudarshana Bandyopadhyay
Regn No.: IN/PA 2802
Agent for the Applicants
Email: bandyopadhyay.sudarshana@gmail.com
Phn No: 9748818235

Signature Not Verified

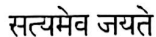
Digitally Signed.
Name: Sudarshana
Bandyopadhyay
Date: 23-Jul-2025 22:58:50
Reason: Patent Filing

FORM 3 THE PATENTS ACT, 1970 (39 of 1970) and THE PATENTS RULES, 2003 STATEMENT AND UNDERTAKING UNDER SECTION 8 (See section 8; Rule 12)					
1. Name of the applicant(s).			We, SRJX RESEARCH AND INNOVATION LAB LLP, Plot No - 3E/474, Sector-9, CDA, Post-Markat Nagar, Cuttack-753014, Odisha, India hereby declare:		
2. Name, address and nationality of the joint applicant.			(i) that we have not made any application for the same/substantially the same invention outside India Or (ii) that we who have made this application No date _____ alone/ jointly with, made for the same/ substantially same invention, application(s) for patent in the other countries, the particulars of which are given below:		
Name of the country	Date of application	Application No.	Status of the application	Date of publication	Date of grant
N.A.					
3. Name and address of the assignee			(iii) that the rights in the application(s) have been assigned to SRJX RESEARCH AND INNOVATION LAB LLP, Plot No - 3E/474, Sector-9, CDA, Post-Markat Nagar, Cuttack-753014, Odisha, India		

Signature Not Verified

Digitally Signed.
 Name: Sudarshana Bandyopadhyay
 Date: 23-Jul-2023 22:56:15
 Reason: Patent Filing

	that we undertake that upto the date of grant of the patent by the Controller, we would keep him informed in writing the details regarding corresponding applications for patents filed outside India within six months from the date of filing of such application. Dated this 23rd day of July 2025
4. To be signed by the applicant or his authorized registered patent agent.	 Signature.
5. Name of the natural person who has signed.	Sudarshana Bandyopadhyay Regn. No.: IN/PA 2802 Agent for the applicant Phn No. 9748818235 Email: bandyopadhyay.sudarshana@gmail.com
	To The Controller of Patents, The Patent Office, at Kolkata
Note.- Strike out whichever is not applicable;	



Government of National Capital Territory of Delhi

₹100

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Stamp Duty Amount(Rs.)	: 100 (One Hundred only)



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Signature Not Verified

Digitally Signed:
Name: Sudarshana
Bandyopadhyay
Date: 20-Aug-2025 23:10:37
Reason: Patent Filing

Statutory Alert:

1. The authenticity of this Stamp Certificate should be verified at 'www.shcilestamp.com' or using e-Stamp Mobile App of Stock Holding. Any discrepancy in the details on this Certificate and as available on the website / Mobile App renders it invalid.
2. The onus of checking the legitimacy is on the users of the certificate
3. In case of any discrepancy please inform the Competent Authority.

FORM-26
The Patents Act, 1970
(39 of 1970)
FORM FOR AUTHORIZATION OF A PATENT AGENT/OR ANY PERSON IN A
MATTER OR PROCEEDING UNDER THE ACT
[See Sections 127 and 132; Rule 135]

I, **SRJX RESEARCH AND INNOVATION LAB LLP**, Indian, of the address **SRJX RESEARCH AND INNOVATION LAB LLP, Plot No - 3E/474, Sector-9, CDA, Post- Markat Nagar, Cuttack-753014, Odisha, India**, hereby authorize **Zainab Syed & Associates** having address **3E, Nawab Bhagwanpora, Lal Bazar, Srinagar, Jammu & Kashmir, 190023, India** (**Mobile No.: +91 9748818235, Email: bandyopadhyay.sudarshana@gmail.com**) through **Ms. Sudarshana Bandyopadhyay (IN/PA 2802)** and **Ms. Meenu Sharma (IN/PA-2856)**, registered Indian Patent Agents, to act on our behalf and to further appoint attorney(s)/agent(s) in connection with the filing and prosecution of our patent applications for grant of Letters Patent, filing of request for examination, filing request for amendment, recordal of change of name and address, ownership, change of address of service in India, renewal of patent, recordal of assignments, filing and defending oppositions and infringement actions, restoration of patents, registration of documents and such other actions and all proceedings under the Patents Act, 1970 and the Patent Rules, 2003 and all such proceedings before the Patent Office or the Government of India or any Court in India and all acts and things as the said attorney may deem necessary or expedient in connection therewith or incidental thereto.

We further request that all notices, requisitions and communication relating thereto may be sent to such person/s at the corresponding address mentioned below:

Ground Floor, S-456, LGF, Greater Kailash – II, New Delhi – 110048, India,

(Contact No.: +91 9748818235; Email: bandyopadhyay.sudarshana@gmail.com)

We, hereby, revoke all previous authorizations, if any, in respect of the proceedings.



We, hereby, assent to the action already taken by the said person/s in the above matter.

Dated this 14th day of August, 2025

SRJX RESEARCH AND INNOVATION LAB LLP

Through:

Signature: *Soumya Ranjan Jena*

Name: Dr. Soumya Ranjan Jena

Company
Seal:

SRJX Research and Innovation Lab LLP
LLPIN: ACO-1435

To,
The Controller of Patents,
The Patent Office,
Kolkata



ATTESTED

Notary Public Delhi

16 AUG 2025