पेटेंट कार्यालय
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OFFICIAL JOURNAL
OF
THE PATENT OFFICE

निर्गमन सं. 10/2024	शुक्रवार	दिनांक: 08/03/2024
ISSUE NO. 10/2024	FRIDAY	DATE: 08/03/2024

पेटेंट कार्यालय का एक प्रकाशन
PUBLICATION OF THE PATENT OFFICE

(12) PATENT APPLICATION PUBLICATION
(19) INDIA
(22) Date of filing of Application :22/02/2024

(21) Application No.202441012996 A
(43) Publication Date : 08/03/2024

(54) Title of the invention : A SYSTEM BY USING NEURAL NETWORKS FOR 3D SURFACE STRUCTURE ESTIMATION BASED ON REAL-WORLD DATA FOR AUTONOMOUS SYSTEMS AND APPLICATIONS

(51) International classification :G06F0003010000, G06N0003040000, B64C0039020000, G06N0020000000, G05D0001000000
(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 :
[043] The proposed invention is a comprehensive system designed for the accurate estimation of 3D surface structures from real-world data, utilizing advanced neural networks. This system significantly enhances the perception capabilities of autonomous systems across various applications, including autonomous vehicles, drones, robotics, and augmented/virtual reality environments. By processing data from diverse sensors like cameras and LiDAR, the invention provides detailed and dynamic 3D models of environments, enabling these systems to navigate and interact with their surroundings with unprecedented precision and safety. The core of this invention lies in its sophisticated machine learning algorithms, which automate the interpretation of complex sensor data, ensuring high accuracy and efficiency in real-time 3D modeling. This innovative approach not only improves the operational capabilities of autonomous systems but also opens up new possibilities for their application in complex and changing environments. Accompanied Drawing [FIGS. 1-2]

No. of Pages : 21 No. of Claims : 10

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 ( )

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Are all the inventor(s) same as the applicant(s) named above?	Yes (✓)	No ()

If "No", furnish the details of the inventor(s)

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Same as Applicant			

5. TITLE OF THE INVENTION

"A SYSTEM BY USING NEURAL NETWORKS FOR 3D SURFACE STRUCTURE ESTIMATION BASED ON REAL-WORLD DATA FOR AUTONOMOUS SYSTEMS AND APPLICATIONS"

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~~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)~~

~~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~~

~~11. IN CASE OF PATENT OF ADDITION FILED UNDER SECTION 54, PARTICULARS OF MAIN~~
~~APPLICATION OR PATENT~~

~~Main application/patent No.~~	~~Date of filing of main application~~

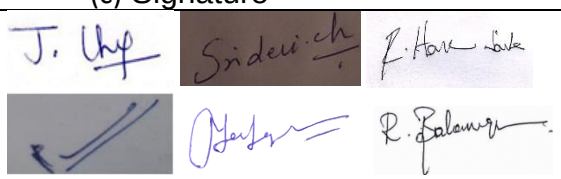
12. DECLARATIONS

(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).

I/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 20/02/2024

(b) Name	(c) Signature
1. Mrs. J. Uma 2. Mrs. Chakradhara Sridevi 3. Mr. R. Hanumanth Naik 4. Dr. J. Ramya 5. Dr. P. Jesu Jayarin 6. Mr. R. Balamurugan 7. Mr. P K Kumar	

(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.

(a) Date

(b) Signature(s)

(c) Name(s) of the signatory

(iii) Declaration by the applicant(s)

I/We the applicant(s) hereby declare(s) that: -

- I am/ We are in possession of the above-mentioned invention.
- The provisional/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 me/us.
- I am/we are the true & first inventor(s).
- I am/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/countries in respect of my/our invention(s).
- I/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 me/us or by any person from which I/We derive the title.
- My/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 inParagraph-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

Item	Details	Fee	Remarks

Complete/ ~~Provisional~~ specification) #	No. of pages: 17		
No. of Claim(s)	No. of claims: 10 No. of pages: 02		
Abstract	No. of pages: 01		
No. of Drawing(s)	No. of drawings: 02 No. of pages: 01		

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) Complete specification (in conformation with the international application)/as amended before the International Preliminary Examination Authority (IPEA), as applicable (2 copies).

(c) Sequence listing in electronic form

(d) Drawings (in conformation with the international application)/as amended before the International Preliminary Examination Authority (IPEA), as applicable (2 copies).

(e) Priority document(s) or a request to retrieve the priority document(s) from DAS (Digital Access Service) if the applicant had already requested the office of first filing to make the priority document(s) available to DAS.

(f) Translation of priority document/Specification/International Search Report/International Preliminary Report on Patentability.

(g) Statement and Undertaking on Form 3

(h) Declaration of Inventorship on Form 5

(i)Power of Authority

(j)**Total fee ₹…….in Cash/ Banker's Cheque /Bank Draft bearing No..... Date on ……. Bank.**

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

Dated this 20th day of February 2024

Signature: J. Uma

Name: Mrs. J.Uma et. al.

To,

The Controller of Patents

The Patent Office, at Chennai

Note: -

* Repeat boxes in case of more than one entry.
* To be signed by the applicant(s) or by authorized registered patent agent otherwise where mentioned.
* Tick ()/cross (x) whichever is applicable/not applicable in declaration in paragraph-12.
* Name of the inventor and applicant should be given in full, family name in the beginning.
* Strike out the portion which is/are not applicable.
* For fee: See First Schedule";

FORM 2

THE PATENTS ACT, 1970

(39 of 1970)

&

The Patent Rules, 2003

COMPLETE SPECIFICATION

(See section 10 and rule 13)

TITLE OF THE INVENTION

"A SYSTEM BY USING NEURAL NETWORKS FOR 3D SURFACE STRUCTURE ESTIMATION BASED ON REAL-WORLD DATA FOR AUTONOMOUS SYSTEMS AND APPLICATIONS"

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7. Mr. P K Kumar	Indian	Senior Physical Director, Sri Sairam Engineering College, Sai Leo Nagar, West Tambaram, Chennai – 600044

The following specification particularly describes the nature of the invention and the manner in which it is performed:

FIELD OF THE INVENTION

[001] The field of invention for the proposed system pertains to computational algorithms and artificial intelligence, with a specific focus on the application of neural networks for the analysis and interpretation of real-world data to estimate 3D surface structures.

[002] This system is designed to enhance autonomous systems and applications by providing them with the capability to accurately perceive and understand their environment in three dimensions. Such a technology finds its relevance in a variety of sectors including robotics, autonomous vehicle navigation, virtual and augmented reality, and remote sensing.

[003] The core innovation lies in leveraging advanced machine learning techniques to process and analyze data from various sensors, such as cameras and lidar, to construct detailed and accurate 3D models of the surrounding environment. This enables autonomous systems to make more informed decisions based on the comprehensive spatial understanding of their surroundings, thereby improving their efficiency, safety, and overall functionality in complex and dynamically changing environments.

BACKGROUND OF THE INVENTION

[004] The following description provides the information that may be useful in understanding the present invention. It is not an admission that any of the information provided herein is prior art or relevant to the presently claimed invention, or that any publication specifically or implicitly referenced is prior art.

[005] Further, the approaches described in this section are approaches that could be pursued, but not necessarily approaches that have been previously

conceived or pursued. Therefore, unless otherwise indicated, it should not be assumed that any of the approaches described in this section qualify as prior art .

[006] The advent of autonomous systems has marked a significant milestone in the evolution of technology, bridging the gap between theoretical computer science and practical applications in the real world. As these systems become increasingly prevalent across various sectors, including autonomous vehicles, drones, robotics, and augmented/virtual reality, the need for advanced perception and understanding of the environment becomes paramount. This is where the proposed system, leveraging neural networks for 3D surface structure estimation based on real-world data, finds its significance.

[007] The concept of using machine learning, particularly neural networks, for interpreting and processing data is not new. However, the application of such technologies for the precise estimation of 3D surface structures is a relatively recent development, spurred by advancements in computing power, sensor technology, and algorithmic innovations. The backbone of this proposed system lies in its ability to accurately model the physical world in three dimensions, using data captured from a variety of sensors. These sensors, which include but are not limited to cameras, LiDAR (Light Detection and Ranging), and radar, provide raw data that, while rich in information, requires sophisticated processing to be fully utilized.

[008] The challenge in estimating 3D structures from sensor data is multifaceted. It involves not only the accurate detection of objects and their spatial relations but also the interpretation of complex scenes that change over time. Traditional approaches relied heavily on geometric algorithms and manual

feature extraction, which, while effective to a degree, lacked the flexibility and depth of understanding that neural networks offer. Neural networks, with their ability to learn from data, provide a means to automatically identify patterns, features, and relationships in the data, which are crucial for accurate 3D surface estimation.

[009] The development of Convolutional Neural Networks (CNNs) and their variants has been particularly influential in this domain. These networks are adept at processing spatial information, making them ideal for analyzing images and sensor data to construct 3D models of the environment. Moreover, advancements in deep learning techniques have enabled the training of models on vast datasets, significantly improving their accuracy and reliability. This is critical for autonomous systems, where errors in perception can lead to catastrophic outcomes.

[010] Another key aspect of the proposed system is its focus on real-world data. Unlike controlled environments or simulations, the real world presents a chaotic and unpredictable array of variables. Weather conditions, lighting changes, and dynamic obstacles are just a few examples of the challenges that autonomous systems must navigate. The ability of neural networks to generalize from diverse datasets means that they can adapt to these changing conditions, providing consistent and reliable 3D surface estimations.

[011] The integration of such a system into autonomous technologies offers numerous benefits. For autonomous vehicles, it enhances navigation and safety by providing detailed models of the road and its surroundings, including other vehicles, pedestrians, and obstacles. In robotics, it enables more sophisticated interaction with objects and environments, from precise

manipulation tasks to complex navigation within unstructured spaces. For virtual and augmented reality applications, it allows for the creation of more immersive and interactive experiences by accurately mapping and integrating real-world environments.

[012] Despite its promising capabilities, the development and implementation of this system are not without challenges. These include the computational demands of processing and analyzing large volumes of data in real time, the need for large and diverse datasets to train the neural networks, and the ongoing refinement of algorithms to improve accuracy and efficiency. Furthermore, ethical considerations regarding privacy and safety must be addressed, ensuring that the deployment of such technologies does not infringe upon individual rights or compromise public welfare.

[013] The importance of this proposed system extends beyond the immediate technological advancements it represents; it also signals a shift towards more integrated and intelligent systems capable of autonomous operation in complex, real-world environments. As we delve deeper into the potential applications and implications of this technology, it becomes clear that its development could fundamentally alter the landscape of numerous industries and societal functions.

[014] In the realm of urban planning and infrastructure management, for instance, the ability to accurately model environments in three dimensions can revolutionize the way cities are designed, built, and maintained. By providing detailed and dynamic models of urban areas, planners and engineers can more effectively address challenges related to traffic flow, public safety, and sustainable development. This could lead to smarter, more resilient cities that

are better equipped to respond to the needs of their inhabitants and the challenges posed by climate change and urbanization.

[015] Moreover, the proposed system's impact on the field of environmental monitoring and conservation is profound. With the capability to generate accurate 3D models of natural landscapes, researchers can monitor changes in ecosystems over time, assess the effects of climate change, and implement more effective conservation strategies.

[016] This technology could provide critical data for tracking deforestation, glacier retreat, and changes in biodiversity, offering a powerful tool for environmental protection and sustainability efforts.

[017] The healthcare sector also stands to benefit from advancements in 3D surface structure estimation. In medical imaging and surgery, for example, the ability to create precise 3D models of anatomical structures can enhance diagnostic accuracy, surgical planning, and patient outcomes. This could open new frontiers in personalized medicine, where treatments and interventions are tailored to the individual patient based on detailed 3D models of their anatomy.

[018] Despite the immense potential of this technology, it is crucial to approach its development and implementation with caution. The reliance on neural networks and artificial intelligence raises questions about transparency, accountability, and bias. Ensuring that these systems are developed in an ethical and responsible manner requires rigorous testing, validation, and oversight. This includes addressing potential biases in the training data, safeguarding against the misuse of technology, and ensuring that the benefits of these advancements are accessible to all segments of society.

[019] Furthermore, the integration of autonomous systems into everyday life raises important considerations about human-machine interaction. As these systems become more capable and autonomous, finding the right balance between automation and human oversight will be critical. This includes designing systems that are not only technically proficient but also understandable and controllable by human operators, ensuring that technology augments human capabilities rather than replacing them.

[020] In this respect, before explaining at least one object of the invention in detail, it is to be understood that the invention is not limited in its application to the details of set of rules and to the arrangements of the various models set forth in the following description or illustrated in the drawings. The invention is capable of other objects and of being practiced and carried out in various ways, according to the need of that industry. Also, it is to be understood that the phraseology and terminology employed herein are for the purpose of description and should not be regarded as limiting.

[021] These together with other objects of the invention, along with the various features of novelty which characterize the invention, are pointed out with particularity in the disclosure. For a better understanding of the invention, its operating advantages and the specific objects attained by its uses, reference should be made to the accompanying drawings and descriptive matter in which there are illustrated preferred embodiments of the invention.

SUMMARY OF THE PRESENT INVENTION

[022] The proposed invention is a cutting-edge system designed to harness the power of neural networks for the estimation of 3D surface structures from real-world data, aimed at enhancing the capabilities of autonomous systems and

applications. At its core, the invention leverages advanced machine learning techniques, specifically deep learning and convolutional neural networks (CNNs), to process and analyze data collected from various sensors such as cameras and LiDAR. This allows for the creation of accurate and detailed 3D models of the environment, which are essential for the operation of autonomous vehicles, drones, robotics, and augmented/virtual reality applications.

[023] The significance of this system lies in its ability to interpret complex and dynamically changing real-world scenes, enabling autonomous systems to navigate and interact with their surroundings more effectively and safely. By automating the feature extraction and pattern recognition processes, the system can adapt to a wide range of conditions, from urban landscapes to natural environments, enhancing its applicability across numerous sectors.

[024] The development of this technology addresses several challenges, including the computational demands of processing large volumes of data in real-time and the need for extensive and diverse training datasets to improve model accuracy. Moreover, the system's implementation raises important considerations regarding privacy, safety, and ethical use of AI, necessitating careful oversight and adherence to ethical guidelines.

[025] In summary, the proposed invention represents a significant advancement in the field of artificial intelligence and autonomous systems, offering the potential to revolutionize how machines perceive and interact with the world around them. Its development not only promises to enhance the functionality and safety of autonomous technologies but also opens up new possibilities for innovation across a variety of fields. However, realizing its full

potential will require addressing both technical and ethical challenges, ensuring that such technologies are developed responsibly and for the benefit of society as a whole.

BRIEF DESCRIPTION OF THE DRAWINGS

[026] When considering the following thorough explanation of the present invention, it will be easier to understand it and other objects than those mentioned above will become evident. Such description refers to the illustrations in the annex, wherein:

[027] FIG. 1, illustrates a general functional working diagram, in accordance with an embodiment of the present invention.

[028] FIG. 2, illustrates a concept of the functional flow diagram, in accordance with an embodiment of the present invention. in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[029] The following sections of this article will provide various embodiments of the current invention with references to the accompanying drawings, whereby the reference numbers utilised in the picture correspond to like elements throughout the description. However, this invention is not limited to the embodiment described here and may be embodied in several other ways. Instead, the embodiment is included to ensure that this disclosure is extensive and complete and that individuals of ordinary skill in the art are properly informed of the extent of the invention.

[030] Numerical values and ranges are given for many parts of the implementations discussed in the following thorough discussion. These

numbers and ranges are merely to be used as examples and are not meant to restrict the claims' applicability. A variety of materials are also recognised as fitting for certain aspects of the implementations. These materials should only be used as examples and are not meant to restrict the application of the innovation.

[031] Referring now to the drawings, these are illustrated in **FIG. 1&2,** The proposed invention is a sophisticated technological system designed to revolutionize the way autonomous systems perceive and interact with the world by leveraging the power of neural networks for the estimation of 3D surface structures from real-world data. This system represents a significant leap forward in the fields of artificial intelligence (AI) and machine learning, particularly in the application of convolutional neural networks (CNNs) and deep learning algorithms that are capable of processing and analyzing vast amounts of data collected from a variety of sensors, including cameras, LiDAR, and radar.

[032] The essence of this invention lies in its ability to transform raw sensor data into accurate, detailed 3D models of the environment, thereby enabling autonomous systems such as vehicles, drones, and robots to navigate and perform tasks with unprecedented precision and safety. This is particularly crucial in complex, dynamically changing environments where the ability to quickly and accurately understand spatial relationships and obstacles can be the difference between success and failure.

[033] One of the key challenges that this system addresses is the inherent difficulty in interpreting the vast, unstructured data generated by sensors in real-world settings. Traditional methods of 3D modeling often rely on extensive

manual intervention and are limited by the complexity and variability of the environments they attempt to model. In contrast, the proposed system utilizes advanced neural networks that learn from data, allowing them to automatically identify patterns, features, and relationships crucial for accurate 3D surface estimation.

[034] The application of this technology is wide-ranging and transformative. In the automotive industry, for example, it can significantly enhance the capabilities of autonomous vehicles by providing them with a deeper, more nuanced understanding of their surroundings, thereby improving safety and efficiency. In robotics, it can enable machines to navigate and interact with their environment and objects within it with a level of sophistication previously unattainable, opening up new possibilities for automation in manufacturing, logistics, and even domestic settings.

[035] Furthermore, the proposed system has significant implications for virtual and augmented reality (VR/AR) applications. By creating accurate 3D models of real-world environments, it can provide more immersive and interactive experiences, blurring the lines between the digital and physical worlds and expanding the potential uses of VR/AR technology in entertainment, education, and beyond.

[036] Despite its groundbreaking potential, the development and implementation of this system are not without challenges. The computational demands of processing and analyzing large volumes of sensor data in real time are substantial. Moreover, the system requires access to extensive and diverse datasets to train the neural networks effectively, ensuring they can generalize well across different environments and conditions. This necessitates not only

significant technical resources but also careful consideration of data privacy and security concerns.

[037] In addition, as with any technology that relies heavily on AI and machine learning, there are ethical considerations to be taken into account. The development and deployment of this system must be guided by principles that ensure fairness, transparency, and accountability, particularly when used in applications that directly impact human lives, such as autonomous vehicles and healthcare.

[038] Building on the foundational claims of the proposed invention, the system's design integrates state-of-the-art neural network architectures and machine learning techniques to redefine the capabilities of autonomous systems in perceiving and understanding their environments. At its core, the invention leverages the unparalleled processing power of convolutional neural networks (CNNs) to analyze and interpret complex sensor data, translating it into precise 3D models of the surrounding environment. This innovative approach enables a level of spatial awareness and environmental interaction that is critical for the next generation of autonomous technologies.

[039] The system's unique capability to integrate and process data from a multitude of sensors, including but not limited to cameras and LiDAR, allows for the creation of highly accurate and dynamic 3D environmental models. These models are essential for a wide range of applications, from enhancing the navigation systems of autonomous vehicles to improving the efficiency and safety of robotic operations in unpredictable environments. Furthermore, the technology opens up new avenues for creating more immersive and interactive

experiences in virtual and augmented reality, bridging the gap between digital and physical worlds.

[040] A pivotal aspect of the invention is its dynamic adaptation mechanism. The neural network models employed within the system are designed for continuous learning and improvement, utilizing new data inputs to refine and enhance their predictive capabilities over time. This ensures that the system remains effective and accurate even as environmental conditions change or new types of sensor data become available.

[041] Moreover, the proposed system addresses one of the key challenges in the field of artificial intelligence and autonomous systems: the computational demands of real-time data processing and analysis. Through innovative algorithmic optimizations and the strategic use of computational resources, the system is able to minimize latency and maximize efficiency, ensuring that autonomous systems can rely on up-to-the-minute information for decision-making processes.

[042] The invention also places a strong emphasis on safety and ethical considerations. By providing autonomous systems with a more accurate and comprehensive understanding of their surroundings, the technology significantly reduces the risk of errors that could lead to accidents or unsafe situations. Additionally, the development and deployment of the system are guided by principles that ensure fairness, transparency, and accountability, particularly in applications that have a direct impact on human lives.

We claim:

1. A method for estimating 3D surface structures utilizing neural networks, designed to process and analyze real-world sensor data, thereby enhancing the accuracy and efficiency of 3D modeling for autonomous systems.
2. The method of claim 1, further comprising the dynamic adaptation of neural network models to continuously improve the accuracy of 3D surface estimation based on accumulating and evolving data inputs.
3. The method of claim 1, wherein convolutional neural networks (CNNs) are employed for the automated extraction and analysis of features from sensor data, facilitating precise and comprehensive 3D modeling of environments.
4. The method of claim 1, incorporating a process for the integration of data from multiple sensor types, including but not limited to cameras and LiDAR, to generate detailed and dynamic 3D models that accurately represent the physical world.
5. The method of claim 1, including a technique for real-time processing and analysis of sensor data, enabling immediate and accurate estimation of 3D surfaces, critical for the operation of autonomous systems in dynamic environments.
6. The method of claim 1, applied to enhance the navigation and safety features of autonomous vehicles through detailed and precise 3D mapping of their operating environments, leveraging the improved spatial awareness provided by the system.
7. The method of claim 1, utilized in robotic systems to enable advanced navigation and interaction capabilities with both stationary and moving objects

within their environment, facilitated by accurate and real-time 3D environmental modeling.

8. The system of claim 1, adapted for creating immersive 3D models for virtual and augmented reality applications, directly from real-world data, thereby enhancing the realism and interactivity of virtual experiences.
9. The method of claim 2, wherein the continuous learning and adaptation of neural network models are facilitated through a structured framework that systematically incorporates new sensor data inputs, ensuring the models remain effective across varying conditions and over time.
10. The method of claim 1, optimized to minimize computational demands while maximizing the accuracy and efficiency of the real-time 3D surface estimation process, ensuring the practical applicability of the system in a wide range of autonomous applications.

Dated this 20th day of February 2024

Signature: J. Uma

Applicant(s)

Mrs. J.Uma et. al.

ABSTRACT

A SYSTEM BY USING NEURAL NETWORKS FOR 3D SURFACE STRUCTURE ESTIMATION BASED ON REAL-WORLD DATA FOR AUTONOMOUS SYSTEMS AND APPLICATIONS

[043] The proposed invention is a comprehensive system designed for the accurate estimation of 3D surface structures from real-world data, utilizing advanced neural networks. This system significantly enhances the perception capabilities of autonomous systems across various applications, including autonomous vehicles, drones, robotics, and augmented/virtual reality environments. By processing data from diverse sensors like cameras and LiDAR, the invention provides detailed and dynamic 3D models of environments, enabling these systems to navigate and interact with their surroundings with unprecedented precision and safety. The core of this invention lies in its sophisticated machine learning algorithms, which automate the interpretation of complex sensor data, ensuring high accuracy and efficiency in real-time 3D modeling. This innovative approach not only improves the operational capabilities of autonomous systems but also opens up new possibilities for their application in complex and changing environments.

Accompanied Drawing **[FIGS. 1-2]**

Dated this 20th day of February 2024

Signature: J. Uma

Applicant(s)

Mrs. J.Uma et. al.

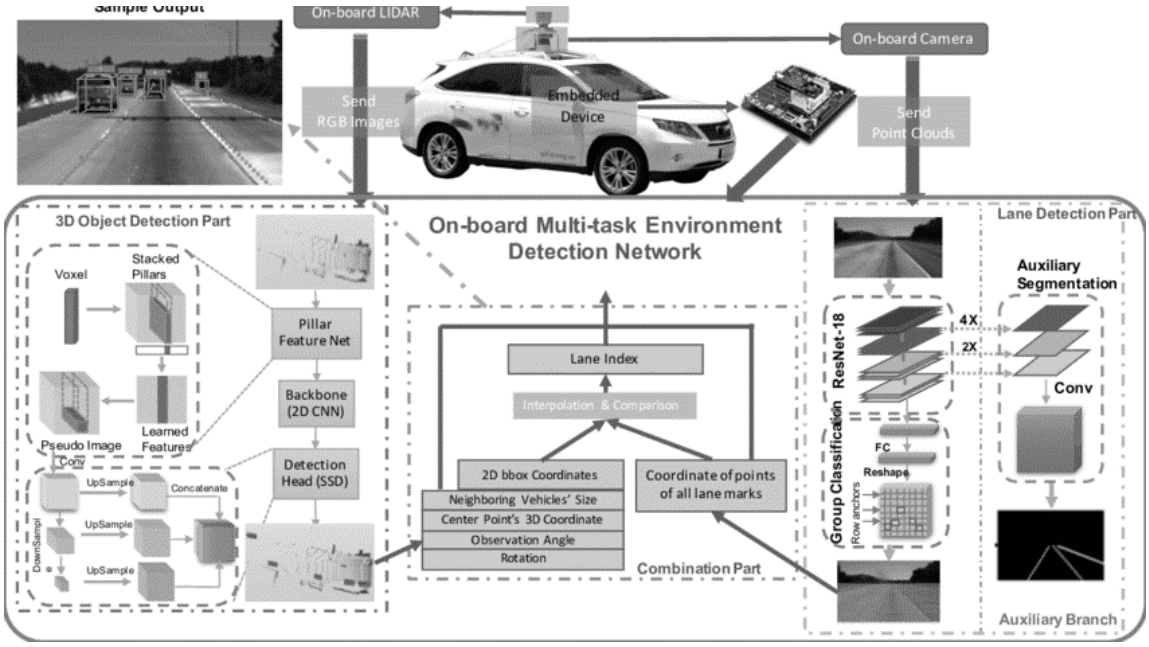


Figure 1

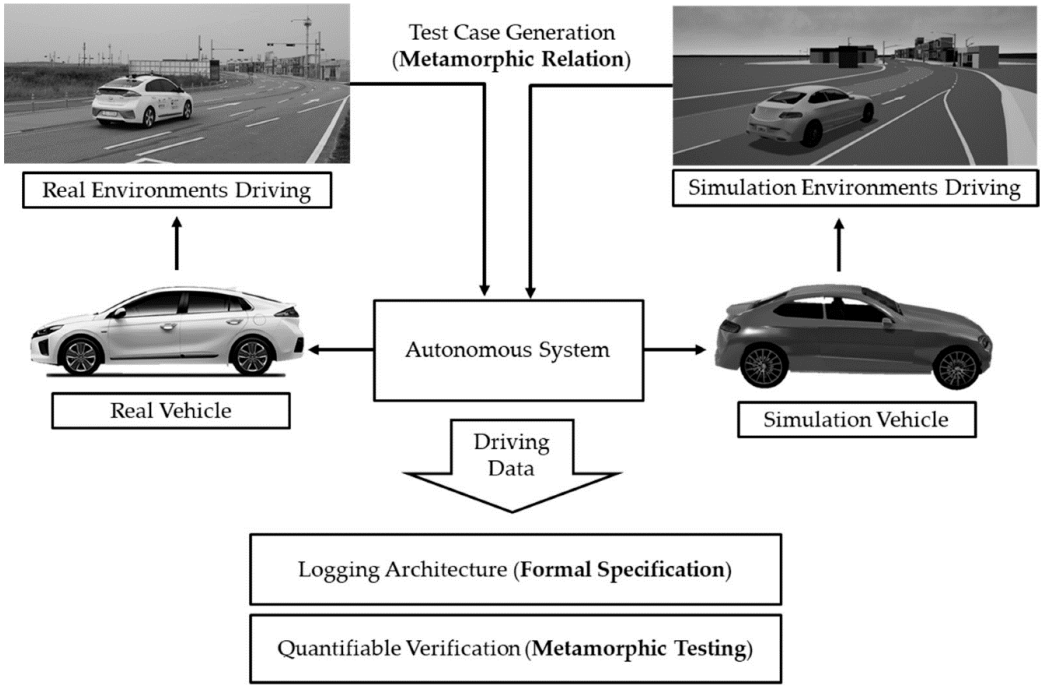


Figure 2

Dated this 20th day of February 2024

Signature:

Applicant(s) Name: Mrs. J.Uma et. al.

FORM 3

THE PATENTS ACT,
1970 (39 of 1970)
and
THE PATENTS RULES, 2003

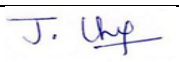
STATEMENT AND UNDERTAKING UNDER SECTION 8

(See section 8; Rule 12)

1. Name of the applicant(s).	I/We, Mrs. J.Uma et. al., all are citizen of India, Address of one of the Applicant: Assistant Professor, Department of Computer Science and Engineering, Jai Shriram Engineering College, Avinashipalayam, Tirupur – 641665, Tamil Nadu.
2. Name, address and nationality of the joint applicant.	(i) that I/We have not made any application for the same/substantially the same invention outside India Or (ii) ~~that I/We who have made this application No… dated 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
-	-	-	-	-	-

3. Name and address of the assignee	(iii) that the rights in the application(s) has/havebeen assigned to …… none …… …… …… that I/We undertake that upto the date of grant of the patent by the Controller, I/We would keep him informed in writing the details regarding corresponding applications for patents filed outside India within six monthsfrom the date of filing of such application. **Dated this 20th day of February 2024**

4. To be signed by the applicant or his authorized registered patent agent.	**Signature:** 
5. Name of the natural person who has signed.	Mrs. J.Uma et. al. **Name of the Applicant(s)**
	To The Controller of Patents, The Patent Office, at Chennai
Note.- Strike out whichever is not applicable;	

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 THE APPLICANT(S)

I/We, Mrs. J.Uma et. al., all are citizen of India, Address of one of the Applicant: Assistant Professor, Department of Computer Science and Engineering, Jai Shriram Engineering College, Avinashipalayam, Tirupur – 641665, Tamil Nadu.

hereby declare that the true and first inventor(s) of the invention disclosed in the complete specification filed in pursuance of ~~my~~ / our application numbered _____ dated 20-02-2024 ~~is/~~are

2. INVENTOR(S)

(a) NAME	**(b) NATIONALITY**	**(c) ADDRESS**
1. Mrs. J.Uma	Indian	Assistant Professor, Department of Computer Science and Engineering, Jai Shriram Engineering College, Avinashipalayam, Tirupur – 641665, Tamil Nadu
2. Mrs. Chakradhara Sridevi	Indian	Assistant Professor, Department of Computer Science and Engineering, Avanthi Institute of Engineering and Technology, Cherukupally (Village), Near Tagarapuvalasa Bridge, Vizianagaram (Dist.), 531162
3. Mr. R.Hanumanth Naik	Indian	Assistant Professor, Department of Electrical and Electronics Engineering, Chalapathi Institute of Technology, Guntur - 522016, Andhra Pradesh
4. Dr. J. Ramya	Indian	Professor, Department of Artificial Intelligence and Data Science, St.Joseph's College of Engineering, Old Mamallapuram Road, Chennai – 600119, Tamilnadu
5. Dr. P.Jesu Jayarin	Indian	Professor, Department of Quantum Intelligence, Saveetha School of Engineering, SIMATS, Chennai - 602105

6. Mr. R.Balamurugan	Indian	Assistant Professor, Department of Electronics and Communication Engineering, K.Ramakrishnan College of Engineering, Trichy - 621112
7. Mr. P K Kumar	Indian	Senior Physical Director, Sri Sairam Engineering College, Sai Leo Nagar, West Tambaram, Chennai – 600044

~~3. DECLARATION TO BE GIVEN WHEN THE APPLICATION IN INDIA IS FILED BY THE APPLICANT(S) IN THE CONVENTION COUNTRY: -~~

N.A.

~~We the applicant(s) in the convention country hereby declare that our right to apply for a patent in India is by way of assignment from the true and first inventor(s).~~

Dated this 20th day of February 2024

Mrs. J.Uma et. al.

Applicant(s)

To,
The Controller of Patents
The Patent Office, Chennai

FORM 9

THE PATENT ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003

REQUEST FOR PUBLICATION

[See section 11A (2) rule 24A]

I/We **Mrs. J.Uma,Mrs. Chakradhara Sridevi,Mr. R.Hanumanth Naik,Dr. J. Ramya,Dr. P.Jesu Jayarin,Mr. R.Balamurugan,Mr. P K Kumar** hereby request for early publication of my/our [Patent Application No.] TEMP/E-1/13882/2024-CHE

Dated **20/02/2024 00:00:00** under section 11A(2) of the Act.

Dated this(Final Payment Date):----------
Signature
Name of the signatory

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

This form is electronically generated.