

**PATENT COOPERATION TREATY**

**PCT**

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference 16PA01390PCT	<b>FOR FURTHER ACTION</b>		See item 4 below
International application No. PCT/CN2016/097664	International filing date ( <i>day/month/year</i> ) 31 August 2016 (31.08.2016)	Priority date ( <i>day/month/year</i> )	
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237			
Applicant SHENZHEN UNIVERSITY			

<p>1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.</p>																								
<p>3. This report contains indications relating to the following items:</p> <table border="0"> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. I</td> <td>Basis of the report</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table> <p>4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).</p>	<input checked="" type="checkbox"/>	Box No. I	Basis of the report	<input type="checkbox"/>	Box No. II	Priority	<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/>	Box No. IV	Lack of unity of invention	<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	<input type="checkbox"/>	Box No. VI	Certain documents cited	<input type="checkbox"/>	Box No. VII	Certain defects in the international application	<input type="checkbox"/>	Box No. VIII	Certain observations on the international application
<input checked="" type="checkbox"/>	Box No. I	Basis of the report																						
<input type="checkbox"/>	Box No. II	Priority																						
<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability																						
<input type="checkbox"/>	Box No. IV	Lack of unity of invention																						
<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement																						
<input type="checkbox"/>	Box No. VI	Certain documents cited																						
<input type="checkbox"/>	Box No. VII	Certain defects in the international application																						
<input type="checkbox"/>	Box No. VIII	Certain observations on the international application																						

	Date of issuance of this report 05 March 2019 (05.03.2019)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer  Xin Wang
Facsimile No. +41 22 338 82 70	e-mail: pct.team2@wipo.int

From the INTERNATIONAL SEARCHING AUTHORITY

To:

**PCT**

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Applicant's or agent's file reference <b>16PA01390PCT</b>		Date of mailing (day/month/year) <b>26 April 2017</b>
		<b>FOR FURTHER ACTION</b> See paragraph 2 below
International application No. <b>PCT/CN2016/097664</b>	International filing date (day/month/year) <b>31 August 2016</b>	Priority date (day/month/year)
International Patent Classification (IPC) or both national classification and IPC G06T 5/00(2006.01)i		
Applicant <b>SHENZHEN UNIVERSITY</b>		

1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/	Date of completion of this opinion	Authorized officer

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/CN2016/097664

## Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
  - the international application in the language in which it was filed.
  - a translation of the international application into \_\_\_\_\_ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2.  This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a)).
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:
  - a. (means)
    - on paper
    - in electronic form
  - b. (time)
    - in the international application as filed
    - together with the international application in electronic form
    - subsequently to this Authority for the purposes of search
4.  In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/CN2016/097664

Box No. V	Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement		
1. Statement			
Novelty (N)	Claims	<u>1-10</u>	YES
	Claims	<u>None</u>	NO
Inventive step (IS)	Claims	<u>1-10</u>	YES
	Claims	<u>None</u>	NO
Industrial applicability (IA)	Claims	<u>1-10</u>	YES
	Claims	<u>None</u>	NO
2. Citations and explanations :			
	[1]	(1) D1: CN 101949693 A, (19 January 2011) D2: CN 102508578 A, (20 June 2012)	
	[2]	D3: CN 105091750 A, (25 November 2015)	
	[3]	D1 is considered to be the closest prior art document, and discloses a method for calibrating a three-dimensional imaging system (refer to entire text), comprising: designing a calibration flat plate to be white, and designing black annular identifiers on the calibration flat plate in a square matrix arrangement wherein the center distance between adjacent identifiers is equal; placing the calibration flat plate at different positions in a measurement field, projecting non-uniform sinusoidal grating stripes having the optimal number of stripes at each placement position onto the surface of the calibration flat plate, and acquiring and calculating an absolute phase for each white pixel point inside the black annular identifiers; extracting the central point position of each identifier from a corresponding absolute phase image and acquiring the relative depths of the identifiers when the calibration flat plate is at each placement position; establishing a high-order polynomial (A) to express the relationship between absolute phases and relative depths; and converting the absolute phases into actual depth data by using polynomial coefficients, thus completing calibration of the three-dimensional imaging system.	
	[4]	D2 discloses a projection positioning device (refer to entire text), comprising: a projector, which is used for projecting stripes having a set pattern onto a surface of an object to be measured; a camera, which is used for capturing a deformed striped image modulated by the shape of the surface of the object to be measured; and a processing device, which is used for determining the spatial position and/or change in position of the object to be measured according to said deformed striped image;	
	[5]	D3 discloses a double four-step phase shift-based projector calibration method (refer to entire text), comprising: 1) selecting a calibration plate; 2) constructing a projector calibration system; 3) using a camera to capture an image of the calibration plate; 4) projecting horizontal and vertical sinusoidal stripes from a digital light processing (DLP) projector onto the calibration plate respectively, and capturing the formed image on the calibration plate; 5) repeating step 4) to obtain sets of four captured images for both the horizontal and vertical direction; 6) using four-step shifting to perform phase extraction on the two sets of captured images for the horizontal and vertical directions respectively, said images being obtained in steps 4) and 5), so as to obtain two phase maps for both the horizontal and vertical directions, and superimposing two phase maps of the same direction to obtain a superimposed phase map; 7) performing phase unwrapping on the superimposed phase map obtained in the same direction so as to obtain phase unwrapped images; 8) using absolute phases in the horizontal and vertical directions obtained from the phase unwrapped images to obtain pixel coordinates ( $\mu$ , $\theta$ ) of the corresponding points from among projector pixel coordinates, and calibrating the projector.	
	[6]	(2) Novelty and Inventive Step	
	[7]	At the very least, neither D1, D2, nor D3 explicitly or implicitly disclose the following subject matter from claims 1 and 6: defining a plane G perpendicular to an optical axis of a projector lens, and calculating a mapping relationship between plane G and a projection plane according to the phase error. Therefore, claims 1 and 6 are novel in the sense of PCT Article 33(2).	
	[8]	On the basis of D1, D2, D3, common general knowledge and any combination thereof, the technical solutions of claims 1 and 6 would not be obvious to a person skilled in the art, so in other words, claims 1 and 6 involve an inventive step in the sense of PCT Article 33(3).	

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/CN2016/097664

Box No. V

Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability;  
citations and explanations supporting such statement

- [9] Claims 2-5, and 9 and 10 directly or indirectly refer to claims 1 and 6 respectively, and are likewise novel in the sense of PCT Article 33(2) and involve an inventive step in the sense of PCT 33(3).
- [10] (3) Industrial Applicability
- [11] The technical solutions of claims 1-10 can be manufactured or used in industry, and are therefore industrially applicable in the sense of PCT Article 33(4).