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- *as to the identity of the inventor (Rule 4.17(i))*
- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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**TITLE OF THE INVENTION**

SEAMLESS VIRTUAL DIAGNOSTIC SYSTEM AND METHOD THEREOF

**FIELD OF THE INVENTION**

The present invention relates to a seamless virtual diagnostic system and method thereof. More particularly, present invention provides an augmented,  
5 modular, flexible, highly scalable and efficient system in healthcare diagnostics where diagnostic experts like pathologists from remote sites are virtually capable of controlling multiple diagnostic analyzers on a real-time basis to conduct and validate the test and the patients are able to view the status of their diagnostic tests and view reports on real-time basis. The  
10 system and method of present invention facilitates patients and pathologists in terms of time, cost, efficiency and clinical accuracy

**BACKGROUND OF THE INVENTION**

The doctors or physicians require the services of pathologists for diagnosis of  
15 diseases from blood and body fluid samples of a patient to arrive at correct course of treatment. Many a times the purpose of the physicians to render services of more than one pathologist could be to obtain secondary opinion in certain circumstances take optimal decisions on the course of the treatment.

20 Presently, the patients' visit to a pathology laboratory where sample/specimen is taken from the patient and the pathologist examine the sample and deliver the report to the patient. Alternatively, in hospitals, the sample/specimen is taken at the hospital and is delivered to pathologist's laboratory for examination. Under best circumstances, the hospitals have

pathology laboratory within its premises reducing the need for the patient to travel to a third party laboratory hence reducing the turnaround time of the diagnostic reports. The diagnostic reports are provided either physically or through electronic means.

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However, considerable resources including time and money are required for a patient - from arrival to the doctor/physician to reaching the pathology laboratory, from drawing of a sample to analysis, from the analysis to reach the pathologist and generation of diagnostic reports. Moreover, if there is  
10 requirement of multiple sub-specialized pathologist expert in different departments such as Hematology, Biochemistry, Immunochemistry, Microbiology, Histopathology for selective disease diagnostics, then there is cost escalation, delay in the diagnosis, co-relation of multiple data points and release of reports which can delay the required treatment and can be life  
15 threatening to the patient. The circumstances where multiple diagnostics are required, the absence of effective system of multiple diagnostics may lead to ineffective clinical outcomes like wrong pharmaceutical prescriptions, unnecessary surgery or multiple surgeries.

20 Most of the hospitals, especially small and medium size do not have sufficient number of pathologists with high level of departmental expertise in diagnosing diseases of single organ system and sample/specimen has to be sent to the laboratories outside the hospitals, thereby enhancing the cost and taking more time to deliver the diagnostic reports. This may result in sample  
25 deterioration that may affect the clinical accuracy when the samples are analyzed.

Healthcare service delivery is increasingly becoming technology dependent, with unprecedented complications in and around delivery of services. There has been significant growth in the industry towards streamlining and standardization of many generic processes. However individual functions  
5 remain complex and knowledge dependent. Some of these shall always remain knowledge dependent and in the domain of clinicians and diagnosticians for providing uncompromising care for patients, while other functions are ripe for automation and re-engineering.

10 Presently, virtual microscopy and digitally enabled pathology analyzers are replacing conventional pathology. There are prior arts for virtual microscopy and for digitally enabled pathology analyzers. However, there is no such system in place to provide a seamless and scalable system starting from entry of the patient at hospital till to provide consolidated diagnostic test report  
15 and consultants opinion in a streamlined way that is fast, cost effective and clinically accurate.

Patent application no. CN102253922A published on 23 Nov 2011 discloses a method for remotely analyzing a pathological section where person who  
20 participates in analysis performs information communication according to a remote network platform. The remote network platform comprises a central management server system, a pathological expert-side microcomputer device, a microscope holding-side microcomputer device and a visit-side microcomputer device in a wide area network environment and realize  
25 network connection, so broadcast surface transmission can be realized, real-time medical images are transmitted, an automatic microscope platform can

be controlled remotely, and interactive voice communication is realized on the basis of sharing the real-time medical images.

Patent application no. CN102368283 discloses a digital slice-based digital remote pathological diagnosis system and a digital slice-based digital remote pathological diagnosis method. The system comprises a remote consultation platform, a plurality of hospital ends and a plurality of specialist ends, wherein each hospital end comprises a fully automatic microscope system and a computer processing system; the fully automatic microscope system is controlled through the computer processing system; a pathological slice is automatically scanned and processed into a digital slice and is stored in a local machine or transmitted to the remote consultation platform or the specialist end through a network, and then a notice is transmitted to the specialist; and the specialist reads and analyzes the digital slice from an appointed storage position according to the notice and transmits a consultation opinion to the hospital end. After the system and the method are adopted, the specialist can diagnose the digital slice through a fixed or mobile terminal at any time and any place and transmits a diagnosis result back to the hospital end. The system and the method are extremely suitable to be used under conditions of vast territory and higher shortage of specialist resources at remote rural areas like China; and through the system and the method, patients of countries can be quickly, accurately and effectively pathologically diagnosed and treated.

The CN102253922A and CN102368283 provides digital microscopy, however, does not teach the patients' access to real-time diagnostic status and reports

electronically. It is limited to interaction between lab technician and pathologist.

Another patent application US5216596 discloses for providing pathology  
5 diagnostic opinions to physicians at sites remote from where the consulting  
pathologist is physically located. The system includes a robotically controlled  
microscope at the remote site equipped with a video camera means for  
collecting video signals from the microscope. The system also uses a  
bidirectional communication means to link the microscope with a pathologist  
10 workstation. The workstation includes a monitor for viewing images received  
from the video camera means and control means for generating control  
signals which are sent over the bidirectional communication means to  
thereby remotely control the microscope. Preferably, the system also includes  
means for electronically storing the X, Y, and Z microscope stage coordinates  
15 for particular points of the specimen viewed by the pathologist together with  
means for storing electronically and reproducing photographically the  
images viewed. The US 5216596 requires workstation set up at the  
pathologists end and the technicians end making the system complicated and  
cumbersome.

20

Therefore, an efficient system that has high clinical accuracy is required to eliminate delays in providing the diagnostic reports and diagnostic opinions at lower costs.

25 In order to obviate the drawbacks in the existing state of art, the present invention provides a system and method of seamless process work flow with

focus of individual users such as front desk/technician/pathologist/  
phlebotomist, their task lists and an end-to-end closure of loops of processes  
handled by them. The system of the present invention is faster, cheaper,  
foolproof, clinically superior and specifically useful in medical emergency  
5 situations.

#### OBJECT AND SUMMARY OF THE INVENTION

The main object of present invention is to provide a seamless virtual  
diagnostic system of testing and validation of patient samples in short turn  
10 around time

Another object of present invention is to provide a seamless virtual  
diagnostic system where the pathologists virtually are capable of controlling  
diagnostic analyzers on real-time basis to view, analyse, conduct, co-relate,  
15 report and validate the test results.

Yet another object of present invention is to provide a seamless virtual  
diagnostic system where the patients are capable of viewing the status of  
diagnostic tests and reports on real-time basis.

20 Yet another object of present invention is to provide a seamless virtual  
diagnostic system where the patients are capable of accessing the diagnostic  
tests and reports on their electronic device.

25 Yet another object of present invention is to provide a virtual diagnostic  
system enabling individual authorized users such as front

desk/technician/pathologist/ phlebotomist to access their task lists and an end-to-end closure of loops of processes handled by them.

Yet another object of present invention is to provide a virtual diagnostic system which is faster, cheaper, foolproof, clinically accurate and specifically  
5 useful in medical emergency situations.

Yet another object of present invention is to provide an augmented, modular, flexible, highly scalable and efficient system in healthcare diagnostics.

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Yet another object of present invention is to provide a seamless virtual diagnostic system to facilitate patients and pathologists in terms of time, cost, efficiency and clinical accuracy.

15 Yet another object of present invention is to provide a method of virtual diagnostic system with focus of seamless process work flow for an end-to-end closure of loops of processes handled by users on real-time basis.

Yet another object of present invention is to provide a method of virtual  
20 diagnostic system enabling the pathologists at remote sites to control various diagnostic analyzers including microscopes on real-time basis to conduct and validate the test.

Yet another object of present invention is to provide a method of virtual  
25 diagnostic system enabling transmittal of multiple data points - Textual, Numerical, Graphical, Image (still and live) from various diagnostic

analyzers to a pathologist or multiple pathologists at remote locations for verification, co-relation, interpretation, reporting and validation of test results, and enabling the pathologist to access, view and control the analyzers including microscopes remotely.

5

Accordingly, the present invention provides a seamless virtual diagnostic system and method thereof. The system of the present invention comprises of Central Information System (CIS), equipment interfacing platform and network architecture enabling seamless economic and efficient virtual  
10 diagnostic method in the field of healthcare technology. The network architecture comprises of remote network server platform and an on-site network server platform.

The system of the present invention is faster, cheaper, foolproof, , modular,  
15 flexible, highly scalable, clinically accurate and specifically useful in medical emergency situations. The system facilitates patients and pathologists in terms of time, cost, clinical accuracy and efficiency.

Virtual diagnostic system of present provides a seamless work flow by  
20 enabling individual users such as front desk/technician/pathologist/phlebotomist to access their task lists and an end-to-end closure of loops of processes handled by them. The system allows the pathologists at remote sites to control analyzers on real-time basis to conduct and validate the tests. The system enables transmittal of multiple data points - Textual, Numerical,  
25 Graphical, Image (still and live) from various diagnostic analyzers to a pathologist or multiple pathologists at remote locations for verification, co-

relation, interpretation, reporting and validation of test results, and enabling the pathologist to control multiple diagnostic analyzers including a microscope remotely.

- 5 The system also allows the patients to view the status of diagnostic tests, quality parameters and validated test reports on real-time basis and to access the diagnostic tests and reports on their electronic device.

The method of virtual diagnostic system focuses on providing a seamless  
10 process work flow for an end-to-end closure of loops of processes handled by users on real-time basis.

The CIS is a combination of real-time data points, scorecards, reports and visual analysis tools that capture, consolidate and display the current status  
15 of critical metrics for the healthcare facilities at single platform. It covers all the major processes for all the departments that are immensely helpful for core management in strategic, analytical and operational decision making.

The CIS is a foolproof and secure system accessible through unique  
20 identification code. The user of the CIS includes authorized user of the system such as front desk, phlebotomist, technician, pathologist. It is not accessible to patients.

The equipment interfacing platform provides the access to the equipment  
25 including various diagnostic analyzers including microscope to the technician and the pathologist. The equipment analyses the test result and

generates four types of data: Textual Data, Numerical data, Graphical data and Images (still or live) (depending on the requested test). In case of Textual data, Numerical data and Graphical – the data are temporarily stored on the on-site network server platform to wait for further action. In case of images  
5 an electronic/ digital microscope automatically focuses on the slide and gives a command to the authorized pathologist user to virtually view and control the movement and find the area of interest. The raw data obtained from equipment interfacing platform are stored in a raw format on the on-site network server platform and transmitted to CIS for conversion into machine  
10 readable medium.

Remote network server platform is connected to equipment interfacing platform. Equipment interfacing platform is connected to CIS where raw data on equipment interfacing platform are converted into machine readable  
15 medium. CIS is accessible to authorized users while raw data available on equipment interfacing platform are accessible to selected authorized users such as pathologist and technician. Patients have access to their validated tests/reports on CIS limited to the data accessible to them through unique number or barcode or identification number to ensure secure and limited  
20 access.

The system and method of the present invention provides a high quality and clinically accuracy that is both economic and faster means of diagnosis in the healthcare system. There is significant reduction in turnaround time and  
25 services of multiple expert pathologists at various locations can be availed simultaneously routinely and in certain critical circumstances or where

physician/doctor needs second or multiple opinion of the diagnosis and line of treatment.

#### **BRIEF DESCRIPTION OF DRAWINGS**

- 5 Fig. 1 depicts the system of of seamless virtual diagnostic system  
Fig. 2 depicts the process work flow of seamless virtual diagnostic system

#### **DETAILED DESCRIPTION OF INVENTION WITH ILLUSTRATIVE EXAMPLES AND DRAWINGS**

- 10 Accordingly, the present invention provides a seamless virtual diagnostic system and method thereof. The system is built on robust, scalable database models and has been stress tested to perform flawlessly during anticipated full scale deployment. Accessibility and availability of clinical information has been given special emphasis to leverage technology for scaling delivery  
15 such that information is made automatically available “when it’s needed, where it’s needed and for whom it’s needed”, enabling seamless economic and efficient virtual diagnostic method in the field of healthcare technology.

- The system and method of the present invention provides high quality,  
20 clinical accurate, economic and faster means of diagnosis in the healthcare system. There is significant reduction in turnaround time and services of multiple expert pathologists at various locations can be availed simultaneously routinely and in certain critical circumstances or where physician/doctor needs second or multiple opinion of the diagnosis and line  
25 of treatment.

Before the present invention and preferred embodiments of the present invention are described, it is understood that this invention is not limited to the particular materials described, as they may vary. It is also understood that the terminology used herein is for the purpose of describing the particular  
5 embodiment only, and is not intended to limit the scope of the invention in any way. For example the term equipment refers to any equipment for diagnostic purpose including various blood and body fluid analyzers. It must be noted that as used herein, the singular forms "a", "an" and "the" include plural reference unless the context clearly dictates otherwise.

10 The system of the present invention comprises of at least one Central Information System (100), at least one equipment interfacing platform (200), at least one network architecture, at least one equipment (300), at least one authorized user (600) and at least one patient (400). Said network architecture comprises of remote network server platform (501) and network server  
15 platform (502).

Said at least one Central Information System (CIS) (100) is a hardware implemented software which displays a combination of real-time data points, scorecards, reports and visual analysis tools that capture, consolidate and  
20 display the current status of critical metrics for the healthcare facilities at single platform. The CIS (100) covers all the major processes for all the departments that are immensely helpful for core management in strategic, analytical and operational decision making. The CIS (100) offers an array of important business insights and alerts to enable the management to  
25 proactively identify problems. The CIS (100) facilitates the decision makers to have an active intervention in real-time and to practice 'management by

exception' at the same time. It (100) displays the current status of the business data and performance at a specific time along with displaying the status and performance over time towards specified goals, helping decision makers to understand what happened, why it happened, and give them the information they need to implement appropriate changes. It (100) also helps them to set targets based on insights and data collected over time. The CIS provides the power to drill through current information, get alerts and identify potential operational issues as they happen.

10 The CIS (100) is a foolproof and secure system where authorized users (600) require unique identification code to have access to it. The authorized users (600) of the CIS (100) includes but not limited to one or more authorized personnel of the system at front office (E1, E2, E3, ..., En), one or more phlebotomist (F1, F2, F3, ..., Fn), one or more technician (T1, T2, T3, ..., Tn),  
15 one or more pathologist (P1, P2, P3, ..., Pn). The CIS (100) is not accessible to patients.

The CIS (100) provides overall summary available on the system. However, to access information pertaining to each of the patient (400) one requires  
20 unique identification code, ensuring the security of data. The CIS (100) provides the information related to billing and finances, overall summary of the patients, supply chain data summary including data tested all across the centers and reruns at all the centers, details of the test conducted.

Said at least one equipment interfacing platform (200) is a computer  
25 implemented software and is connected to one or more equipments (300, 301, 302, 303, 304, 305,...n). The equipment interfacing platform (200) provides

direct access of the equipments to said authorized users (600). Said equipment facing platform (200) stores the raw data on the on-site network server platform (502) that are eventually transmitted to the CIS (100) to convert into machine readable data. The diagnostic data/ reports on CIS are accessible to all authorized users (600) through unique identification number / code/ barcode.

The patient (400) is able to access the diagnostic data and/or report through patient's unique registration details generated and assigned by the CIS (100). The patient's access is limited to the data pertaining to said patient's unique identification number.

To access the data/reports directly at remote location, the patient (400) can download the application of the system on any electronic device on patient portal (401) wherein said electronic device comprises of input modules, output modules and microprocessor. Alternatively, the patient (400) can have access to the CIS (100) through any browser and can see all the updates related to the data and/or report through patient's unique identification number.

The virtual diagnostic system of present invention further comprises of communication means, IC arrangements to convert raw data into transportable data, at least one camera sensor, at least one image sensor, at least one microscope, at least one microprocessor, input devices, output devices, communication means, audio/video or audiovisual means, display unit, storage means and power source.

The authorized pathologist (P1, P2, P3, ..., Pn) is able to access equipments through equipment interfacing platform (200) through any electronic means comprising of at least one control panel, at least one microprocessor, input devices, output devices, communication means, audio/video or audiovisual  
5 means, display unit, storage means.

The system of the present invention enables pathologist (P1, P2, P3, ..., Pn) at remote location to carry out examination of the sample/specimen through electronic means to provide diagnostic report and opinion. The authorized  
10 pathologist (P1, P2, P3, ..., Pn) at remote location is capable of controlling the equipments (300) including microscope by means of control panel, of adjusting and controlling the microscope, the relative position of a specimen to the objective lens, the magnification of the specimen, and the focus of the microscope. The camera sensors and image sensors capture the stereoscopic  
15 images and display the images on the display screen of the electronic means of the pathologist. The pathologist (P1, P2, P3, ..., Pn) at remote location is capable of visualizing the live specimen/sample and also capable to control the stage, of the microscope, focus, magnification and illumination. The pathologist is able to view the video of the sample/specimen in three  
20 dimensional mode.

The system is operated in such a manner that it accommodates all types of patients such as IPD (Inpatients department), OPD (Out-patients Department) as well as emergency patients. The system also enables home  
25 collection of sample.

The system of present invention comprises of software integrated with hardware wherein said system enables process flow including billing, sample collection, sample testing, generation of test result, virtual microscopy for image based testing, storage of data on the system, data validation and report  
5 generation.

The system rely on system generated data with minimum human interference, thereby minimizing the error rates by using various automated barcode printing, sample labeling and dispensing processes.  
10

Artificial intelligence incorporated within the system analyzes patient's data as soon as it is validated and can inform patients, physicians and the authorized users (600) to take appropriate action. The system stores the patient's clinical data forever. The system is developed in such a way that if  
15 the patient (400) goes to another centre enabled with the system of the present invention, the patient portal (401) captures the test results and stores it against the patients registered ID. The patient (400) can print their report at any time, transparently see their samples journey, the quality parameters of the equipments on which the patients sample was performed as well as share  
20 their report and EMR with their physicians.

The method of the present invention comprises the steps of (Fig. 2) :

- Registering patient on the system through unique identification number/code
- Validating the registered details of the patient (400) by the system  
25

- Providing previous health related information on to the system such as prescription
- Selecting the type of investigation by the patient (400) on the system
- Generating the invoice and providing e-payment gateway to the patient for instant transfer of the invoiced amount
- Collecting the sample/specimen of the patient (400) at the laboratory area
- Loading the sample at equipment specific for test for generating numeric test results and/or image data depending on the nature of the test
- Testing of data and generating raw test report
  - by the equipments (300) in case of text, numeric, graphical test results and
  - by transmitting image data to authorized pathologist (P1, P2, P3, ..., Pn) at remote location with a command to remotely view images and/or command and control microscope
- Reviewing and validating of textual, numerical, graphical test results and image test results by the authorized pathologist (P1, P2, P3, ..., Pn) at remote location
- Generating validated diagnostic test report
- Reporting to patient (400) and the front office personnel (E1, E2, E3, ..., En) of diagnostic test report

The system of the present invention provides a method of virtual diagnostic system enabling transmittal of captured image or live feed of images of microscopic slides/specimens to pathologist at remote locations for

validation and enabling the pathologist to command and control microscope or analyzer remotely.

#### **EXAMPLE 1: Registration and Billing**

5 The authorized personnel of the system at front office (E1, E2, E3, ..., En) registers the details of the patient (400) . i.e. Name, DOB, Address, Photo etc. An SMS confirmation will be sent to the registered mobile number with contents such as username and password for the patient (400) to view his report through electronic device.

10

The patient is able to select the type of investigation desired or required to be conducted through the system and can also feed or upload the previous history data and/or prescription received on the system.

15 Thereafter, the system generates the invoice and payment gateways to expedite the diagnostic process. On completion of front office formalities related to registration and billing, the system assigns an internal TAT (turn-around time) alarm that enable the subsequent authorized users (600) to perform their duties in time.

20

The front office is a busy intersection to interact with patients (400) and is often fast-paced. The front office personnel (E1, E2, E3, ..., En) comforts the patients by anticipating their anxieties, answering their queries in completeness, responding to emergencies with a personal touch. The front  
25 office personnel's (E1, E2, E3, ..., En) primary duty is to capture as much of

data both- clinical and demographic as possible so that the pathologist at the other end can give an accurate diagnosis.

#### **EXAMPLE 2: Sample Collection**

5 The phlebotomist (F1, F2, F3, ..., Fn) verifies the patient's identification from the system and gives a command to print a barcode sticker. The barcode sticker is pasted to the sample container and the phlebotomist (F1, F2, F3, ..., Fn) proceeds to collect the sample from the patient. a. In case the sample is not collected within the pre-specified time, an alarm is generated and  
10 notification is sent to the management team and intended phlebotomist (F1, F2, F3, ..., Fn).

The system enables sample collection at the phlebotomy room, can be used on the move and can even be used at each ward level of the hospital.

15

#### **EXAMPLE 3: Testing and Report Generation**

The collected samples are sent to the laboratory area for testing where equipments (300, 301, 302, 303, 304, 305,...n) are installed or placed. The samples are first acknowledged and loaded on the specific equipment (300,  
20 301, 302, 303, 304, 305,...n) depending on the nature of the test. Samples are acknowledged using a barcode scanning procedure to authenticate the sample id with the patient id. Machine intelligence basis the command generated from the front office instructs the equipment (300, 301, 302, 303, 304, 305,...n) to perform the test that the patient (400) has requested for.

25

The equipment (300, 301, 302, 303, 304, 305,...n) analyses the test result and generates various types of data depending on the requested test such as:

- Textual
- Numerical data,
- 5 - Graphical and/ or
- Images (still or live)

In case of Textual data, numerical data, and graphical data the data are temporarily stored on the on-site network server platform (502) to wait for further action. In case of images an electronic/ digital microscope autofocus  
10 on the slide and give a command to the authorized pathologist (P1, P2, P3, ..., Pn) to view the still image or virtually control the movement of the microscope see live image feed and find the area of interest.

The data generated are stored in raw format on equipment interfacing  
15 platform (200). The system on the basis of the search results and command can pull or push the data to any authorized user (600) of the system. Every authorized user (600) of the system has certain privileges that enable him to preview, review or edit the data that has been temporarily stored on the network server platform (502).

20

#### **EXAMPLE 4: Review and Validation**

After the sample testing, the intended data are sent to the authorized pathologist (P1, P2, P3, ..., Pn) for review. The pathologist who can be anywhere in the world would need to log into the system via any electronic  
25 device. A push notification can be sent in case the test result is urgent or is approaching turn-around time.

The authorized pathologist (P1, P2, P3, ..., Pn) is able to receive a worklist by the system and view specific test results of the patients (400). The worklist provides a view to the authorized pathologist (P1, P2, P3, ..., Pn) of the number and type of tests that have been allocated to him. On selection of a patient (400), said authorized pathologist is able to view complete electronic medical record (EMR) of the patient (400). The EMR may include prescription scan, demographic details, clinical history, remarks, machine information, quality parameters, contact details of authorized technician (T1, T2, T3, ..., Tn), textual, numerical and graphical data generated from the equipment (300) and an icon which will take him to the slide image or live view of the microscope.

In case of textual data, numerical data and graphical data the authorized pathologist (P1, P2, P3, ..., Pn) gives a command to validate and/or requests for re-testing of the sample. In case of the image icon, the pathologist gets remote access to the scanned/ stored images or access to the digital microscope through remote network server platform (501). Digital controls via control panel or touch screen guides the authorized pathologist (P1, P2, P3, ..., Pn) to view the whole slide. Once the pathologist (P1, P2, P3, ..., Pn) identifies his area of interest, various icons will be available to the pathologist to capture the area to interest image, take a snapshot, write his remarks, count various cells required for reporting and to validate the diagnostic report.

On completion of the task the system consolidates various diagnostic test reports from multiple analyzers and stores the data on the remote network server platform (501).

5 **EXAMPLE 5: Report Generation and Reporting**

The validated diagnostic test report is stored on the CIS (100) and intimation command are issued to intimation to the authorized personnel of the system at front office (E1, E2, E3, ..., En) and the patient (400) through electronic means. In selected cases, depending upon the medical circumstances,  
10 intimation to the referring physician / doctor is also sent.

15

We claim:

1. A seamless virtual diagnostic system in the field of healthcare technology, said system comprising of
  - at least one Central Information System (CIS) (100)
  - 5 - at least one Equipment Interfacing Platform (200)
  - at least one network architecture
  - at least one equipment (300)
  - at least one authorized user (600)
  - at least one patient (400)
- 10 wherein said system is fully automated with minimum human interference, thereby minimizing the error rates and operates in such a manner to accommodate all types of patients such as IPD (Inpatients department), OPD (Out-patients Department), emergency as well as home care patients.
- 15
2. The seamless virtual diagnostic system as claimed in claim 1 wherein said network architecture comprises of remote network server platform (501) and on-site network server platform (502).
- 20
3. The seamless virtual diagnostic system as claimed in claim 1 wherein said at least one equipment interfacing platform (200) is a computer implemented software and is connected to said one or more equipments (300, 301, 302, 303, 304, 305,...n).
- 25
4. The seamless virtual diagnostic system as claimed in claim 1 wherein said at least one equipment interfacing platform (200) provides direct access of said equipments (300, 301, 302, 303, 304, 305,...n) to said

authorized users (600) through said remote network server platform (501).

- 5 5. The seamless virtual diagnostic system as claimed in claim 1 wherein said at least one CIS (100) is a hardware implemented software which converts raw data transmitted by said Equipment Interfacing Platform (200) to machine readable data.
- 10 6. The seamless virtual diagnostic system as claimed in claim 1 wherein said at least one CIS (100) is accessible to said at least one authorized user (600) through unique identification number/code, thereby making the system foolproof and secure.
- 15 7. The seamless virtual diagnostic system as claimed in claim 1 wherein said equipment facing platform (200) stores the raw data on the on-site network server platform (502) that are eventually transmitted to the CIS (100) to convert into machine readable data.
- 20 8. The seamless virtual diagnostic system as claimed in claim 7 wherein said CIS (100) and equipment interfacing platform (200) communicate to each other through on-site network server platform (502).
- 25 9. The seamless virtual diagnostic system as claimed in claim 1 wherein said authorized users (600) of the CIS (100) includes but not limited to one or more authorized personnel of the system at front office (E1, E2, E3, ..., En), one or more phlebotomist (F1, F2, F3, ..., Fn), one or more

technician (T1, T2, T3, ..., Tn), one or more pathologist (P1, P2, P3, ..., Pn).

- 5 10. The seamless virtual diagnostic system as claimed in claim 1 wherein said patient (400) is capable of viewing the real-time status of the data and test report by getting access to said seamless virtual diagnostic system on any electronic device through web application or browser using registration details generated by said system.
- 10 11. The virtual diagnostic system as claimed in claim 1 wherein said network architecture further comprises of communication means, IC arrangements to convert raw data into transportable data, at least one camera sensor, at least one image sensor, at least one microscope, at least one microprocessor, input devices, output devices, communication means, audio/video or audiovisual means, display unit, storage means  
15 and power source.
12. The virtual diagnostic system as claimed in claim 9 wherein said authorized pathologist (P1, P2, P3, ..., Pn) is able to access equipments  
20 through equipment interfacing platform (200) through any electronic means comprising of at least one control panel, at least one microprocessor, input devices, output devices, communication means, audio/video or audiovisual means, display unit, storage means.
- 25 13. The diagnostic system as claimed in claim 12 wherein said system enables said authorized pathologist (P1, P2, P3, ..., Pn) to control multiple diagnostic equipment and/or microscope remotely.

14. The diagnostic system as claimed in claim 12 wherein said system enables transmittal of still images and or live feed of images of microscopic slides/specimens to said authorized pathologist (P1, P2, P3, ..., Pn) at remote locations for validation.

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15. The virtual diagnostic system as claimed in claim 1 wherein clinical information and/or test reports is readily accessible and available to the patient (400) and the authorized user (600) on real-time basis and as and when needed.

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16. The virtual diagnostic system as claimed in claim 1 wherein said system is a software integrated with hardware enabling seamless process flow including billing, sample collection, sample testing, generation of test result, virtual microscopy for image based testing, storage of data on the system, data validation and report generation.

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17. A method of operating virtual diagnostic system wherein said method comprises the steps of :

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- Registering patient on the system through unique identification number/code
- Validating the registered details of the patient (400) by the system
- Providing previous health related information on to the system such as prescription
- Selecting the type of investigation by the patient (400) on the system
- Generating the invoice and providing e-payment gateway to the patient for instant transfer of the invoiced amount

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- Collecting the sample/specimen of the patient (400) at the laboratory area
- Loading the sample at equipment specific for test for generating numeric test results and/or image data depending on the nature of the test
- Testing of data and generating raw test report
  - by the equipments (300) in case of textual, numeric and graphical test results and
  - by transmitting image data to authorized pathologist (P1, P2, P3, ..., Pn) at remote location with a command to control microscope
- Reviewing and validating of textual, numeric, graphical test results and image test results by the authorized pathologist (P1, P2, P3, ..., Pn) at remote location
- Generating diagnostic test report
- Reporting to patient (400) and the front office personnel (E1, E2, E3, ..., En) of diagnostic test report and physician in case of critical circumstances.

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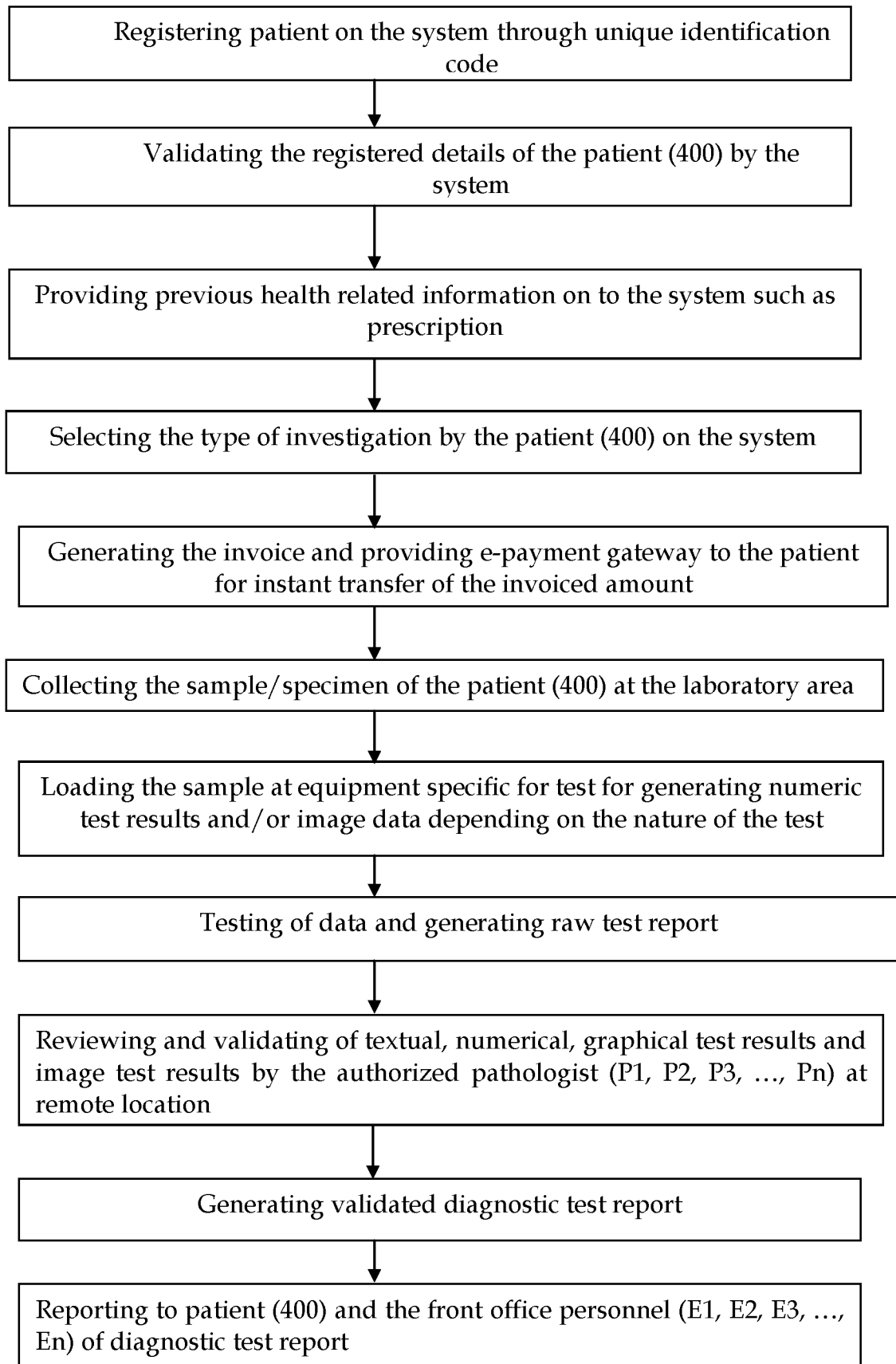


Fig. 2

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/IN2018/050128

A. CLASSIFICATION OF SUBJECT MATTER  
G06F17/30, G16H10/00, G16H20/00 Version=2018.01

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G06F, G16H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

TotalPatent One, IPO Internal Database

Keywords: equipment interface, network, data, user identify, real time

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 20110201904 A1 (OKTX LLC), 18 August 2011 (18-08-2011) paragraphs [0010, 0016, 0039, 0090-0093, 0109, 0111, 0115-0118] , claim 21	1-14
Y	paragraphs [0010, 0016, 0039, 0090-0093, 0109, 0111, 0115-0118] , claim 21	15-17
Y	----- US 20120173267 A1 (Omidi Julian), 05 July 2012 (05-07-2012) paragraphs [0024, 0027-0030, 0037, 0055]	15-17

Further documents are listed in the continuation of Box C.  See patent family annex.

* Special categories of cited documents:	"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 12-06-2018	Date of mailing of the international search report 12-06-2018
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