1a Value Proposition

List the relevant stakeholders for the project.

Identify the stakeholders' needs and list them according to importance.

My stakeholders are:

1. Residents (Junior Doctors in orthopaedic clinics)
2. Consultants (Senior Doctors in orthopedic clinics)

1a Value Proposition

List the relevant stakeholders for the project.

Identify the stakeholders' needs and list them according to importance.

My stakeholders' needs are:

- Residents need to be familiar with the clinical procedures (verbal tests and physical examinations).
- Residents need to communicate with the patients effectively and efficiently while empathizing with them.
- Residents need a greater number of exposures to a variety of medical cases that are uncommonly seen in the clinic.

- Consultants need to pinpoint the residents' mistakes at the time of error, and give instant feedback.
- Consultants need to keep track of the level of proficiency of their residents in different segments of clinicals. (For example how accurate their diagnosis and follow up plans are).
- Consultants need to minimize the extra consultation time that the patient experiences due to the training of the residents.

1b Value Proposition

Establish the problem (Point-of-View).

List as many as possible.

[Who?] needs [What?] because [Why?]:

- Residents need more practice in clinicals to gain more experience and make faster and more accurate diagnosis of the patient.
- Residents need practice in clinicals to be familiar with clinical procedures (verbal tests) to instinctively conduct them while writing the patient report and actively listening out for the patient's needs at the same time.
- Residents need more patient interactions to communicate with the patients effectively and efficiently while empathizing with them and obtain the information needed in the shortest possible time.
- Residents need to be exposed to patients with a variety of medical conditions that are uncommonly seen in the clinic to better prepare them for similar cases in the future.

1b Value Proposition

Establish the problem (Point-of-View).

List as many as possible.

[Who?] needs [What?] because [Why?]:

- Consultants need to constantly monitor the residents to pinpoint their mistakes at the time of error, giving instant feedback to enhance the residents' learning process.

- Consultants need a system to keep track of the level of proficiency of their residents in different segments of clinicals. (For example how accurate their diagnosis and follow up plans are).

- Consultants need a tool to demonstrate the correct clinical procedures to the residents such that patient's consultation time is not extended over the stipulated time (10 minutes).

1c Value Proposition

Formulate the design direction (How might we…?).
List as many as possible.

How might we:

- Create a platform containing a wide variety of patient scenarios for residents to gain experience in clinical assessments to diagnose the patient quickly and more accurately.

- Design a realistic simulation tool to increase the number of interactions between the residents and patients to improve their ability to build rapport and empathise with the patients

- Design an easily accessible simulation tool to make clinical practice more available to residents, helping them gain familiarity with the necessary clinical tests.

- Provide consultants with a fast, user-friendly and portable system to give instant feedback to multiple residents as they are conducting their clinicals, optimizing the learning process of the residents.

1d Value Proposition

Describe existing solutions that may address the problem (e.g. patent details, TRL). Discuss their limitations.

In our analysis of the existing solutions, all solutions showed a high level of Technological Readiness Levels (TRL) levels of 8/9.

Thus, we will be using the **Technological Simulation Level (TSL) framework** to analyse the current solutions. TSL is a scale designed specifically to evaluate and gauge the stage of development of the simulation solutions, yielding a more effective comparison. **Full TSL rubric can be found in appendix.**

1d Value Proposition

Describe existing solutions that may address the problem (e.g. patent details, TRL). Discuss their limitations.

Existing solutions targeted at medical education of orthopedic clinical residents through simulation:

1. Use of Standardised Patients (SP)
2. Use of Simulation through Virtual Reality
    a. Oxford Medical Simulation
    b. SimX Medical Simulation
    c. Acadicus VR Medical Training

**Mannequins are typically used in medical simulations. However, they are not feasible as a solution due to a lack of realistic patient interactions where conversations play a crucial role in patient diagnosis. Furthermore, mannequins only have a Technological Simulation Level of 1, due to a limited range of training functions and a lack of interactivity. As such, we have decided to not include Mannequins as part of our existing solution analysis.

Source: https://www.tandfonline.com/doi/full/10.1080/01421590701551185

1d Value Proposition

Describe existing solutions that may address the problem (e.g. patent details, TRL). Discuss their limitations.

Technological Simulation Level to assess the current solutions

Technological Simulation Level (TSL)	**Level 0**	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**
Simulation Technique	Written simulations includes pen and paper simulations or ‘‘Patient Management Problems’’ and latent images	3D models which can be a basic mannequin, low fidelity simulation models, or part-task simulators	Screen-based simulators Computer simulation, Simulation software, videos, DVDs, or Virtual Reality (VR) and surgical simulators	Standardized patients Real or simulated patients (trained actors), Role play	Intermediate fidelity patient simulators Computer controlled, programmable full body size patient simulators not fully interactive	Interactive patient simulators or Computer controlled model driven patient simulators, also known as high fidelity simulation platforms

Source : https://www.tandfonline.com/doi/full/10.1080/01421590701551185

1d Value Proposition

Describe existing solutions that may address the problem (e.g. patent details, TRL). Discuss their limitations.

1. Use of Standardised Patients

Source: https://journals-sagepub-com.libproxy1.nus.edu.sg/doi/abs/10.1177/0163278706297334

Description	Patent Details	TSL	Limitations
Standardized Patients (SP) are a special set of individuals that are trained to accurately simulate patient behaviour for interacting with medical staff during training clinicals. SPs promotes patient-centered learning for the residents.	NIL	TSL: 3 	Most SPs work part-time, and therefore may result in their limited availability. Some SPs forget their script, creating variability in the scenarios to the students which negatively influences the realism and the learning of the students. Takes considerable training time and investments to train an SP, resulting in limited scalability.

1d Value Proposition

Describe existing solutions that may address the problem (e.g. patent details, TRL). Discuss their limitations.

2. Use of Virtual Reality: Oxford Medical Simulation

Source: http://oxfordmedicalsimulation.com/

Description	Patent details	TSL	Limitations
Users are able to communicate with a patient in a virtual world to give diagnosis and treatment Allows the doctors to be familiar with diagnosis and treatment of a realistic patient (patient will be visibly pale if left alone untreated) Gives user an analysis of what was done right or wrong in the process, providing valuable feedback to enhance the resident's learning.	NIL 	TSL: 4	Scenarios are generalized and not specifically directed at orthopaedic residents, where very specialized patient scenarios are needed. Not very realistic as selection of equipment comes from a drop down text menu, thus decreasing realism for orthopedic residents.

1d Value Proposition

Describe existing solutions that may address the problem (e.g. patent details, TRL). Discuss their limitations.

2. Use of Virtual Reality: SimX Medical Simulation

Source: https://www.simxar.com/

Description	Patent details	TSL	Limitations
Allows residents to diagnose and treat patients who are customised according to their needs. Able to provide haptic feedback that increases the realism of the simulation, boosting the resident's learning experience Increases the familiarity of residents to real diagnosis treatments	Title: Augmented and Virtual Reality Simulator for Professional and Educational Training Abstract: patent for medical training through virtual avatars, and using real life objects projected in virtual space Patent number and link:***20170213473*** http://appft1.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PG01&p=1&u=/netahtml/PTO/srchnum.html&r=1&f=G&l=50&s1=20170213473	TSL: 4	Requires additional medical professionals to operate, thus increasing the strain on medical professional resources which makes this solution unscalable.

1d Value Proposition

Describe existing solutions that may address the problem (e.g. patent details, TRL). Discuss their limitations.

2. Use of Virtual Reality: Acadicus VR Medical Training

Source: https://acadicus.com/

Description	Patent details	TSL	Limitations
Allows users to rehearse training steps in surgical and clinical setting Allows interaction between residents and the consultant for effective communication and real time feedback (eg trainer and trainee) Able to create customized patient scenarios that cater to the learning need of the residents.	NA	TSL: 4	Building the patient scenarios from scratch results in too much work, time and effort for the hospital. They also need to familiarize themselves and be proficient at developing the scenarios (high cost of adoption). No voice interaction between patient and doctor (only physical) decreases realism especially for orthopedic clinicals, which rely heavily on communication for patient diagnosis.

2 Design Statement

Develop a concise design statement based on the value proposition.

The project aims to design: A realistic, user-friendly and easily accessible simulation tool to help orthopedic residents gain more experience and familiarity in clinicals, as well as receive real-time feedback from the consultants.

Appendix: User Analysis (Done by : Eldred Sng)

Overview of Primary research conducted at National University Hospital (NUH)

- Observed **Dr Eugene Lau (Resident)** seeing three separate patients during an orthopaedic clinical session, supervised by **Dr Gabriel Liu (Consultant)**
- Clinical sessions were conducted primarily by the Resident, with the Consultant interfering if he notices the Resident committing any errors
- Clinical conducted for Patient 1 was majorly without guidance, under minimal supervision of Consultant.
- Clinical conducted for Patient 2 was conducted with much more guidance and supervision from the Consultant
- Clinical conducted for Patient 3 was conducted by the Consultant.
- Based on our observations, clinical sessions can be classified into three distinct phases :
    - Verbal test Phase
    - Physical examination Phase
    - Explanation Phase

Appendix: User Analysis (Done by : Eldred Sng)

Persona of Resident

Name: Dr Eugene Lau
Occupation: NUH Orthopedic **Resident**

Key Characteristics:

- Has a very **busy** schedule
- **Limited opportunities** to practice clinicals under guidance from consultant.

Good day in Dr Lau's life:

- Smooth day at the clinic with **minor incidents and mistakes**, easy to figure out patient's mistakes and diagnose them.
- Able to benefit from the short time spent at clinicals and apply his medical knowledge into various scenarios.

Bad Day in Dr Lau's life:

- Difficult to find out patient's problems, **unable to recall** certain medical concepts and getting scolded by the consultant.
- **Misdiagnosing** the patient and getting reprimanded by the consultant.

Resident

She has these tremors in her hands, but it does not affect us

Patient's Daughter

Does not affect us? Her whole body is shaking

[**Consultant steps in after realising Resident has missed an observation regarding the patient**]

Consultant

Her whole body is shaking?

Yes her whole body is shaking

Let's get a C-Spine MRI done as well

Timestamp
24:30 - 23:39

Insights

1. Residents must be able to **observe** and be sensitive to minute details to detect unspoken symptoms.
2. Resident must be able to **identify** external factors and their impact on the final diagnosis.

[**Resident conducts upper limb physical examination on Patient while standing**]

Consultant

If you are doing this test, the patient should be seated down.

[**Resident guides Patient to sit down**]

Resident

Sit down and keep your elbow up. Squeeze my hand.

Patient

Squeeze your hands?

Timestamp
07:33 - 07:50

Insights

1. Resident require more **experience** and **familiarity** with the clinical assessments (verbal and physical).

2. Resident faced difficulty in **recalling** the specific details of clinical assessments (verbal and physical).

Resident

Does your hand (Patient's hand) hurt? A lot of people twist their hands in such a way when washing clothes. [**action of wringing clothes**]

[**Patient's daughter becomes defensive. She assumed that Resident was accusing Patient of doing chores, which resulted in the pain.**]

Patient's daughter

No! I never let her do household chores.

Example…
Example…

Timestamp
25:52 - 26:00

Insights

1. Resident must be able to **empathize** and **build trust** between himself, the patient and their family members.

2. Resident must **communicate** effectively to minimise misunderstandings and obtain all necessary patient information required for diagnosis.

Appendix: User Analysis (Done by : Eldred Sng)

Persona of consultant

Name: Dr Gabriel Liu

Occupation (Academic Appointment): Associate Professor, Department of Orthopedic Surgery

Clinical Appointments:

- Head & Senior **Consultant**
  University Spine Centre
  University Orthopaedics, Hand & Reconstructive Microsurgery Cluster
  National University Health System, Singapore
- Core Faculty
  NUHS Residency Programme
  University Orthopaedics, Hand & Reconstructive Microsurgery Cluster
  National University Health System, Singapore

Appendix: User Analysis (Done by : Eldred Sng)

Persona of consultant

Key Characteristics:

- Always **busy**, moving between 2 clinical rooms and occasionally outside to settle certain management procedures with hospital staff.
- **Confident** in communicating with the patient, due to experience.
- **Familiar** with clinicals to know what mistakes the residents are making.
- **Responsible** for the patients as they are directly under him (not the residents)

Good Day:

- able to **observe** the residents diagnosing their patients one by one, guide them accordingly and intervene **immediately** when they make mistakes.

Bad Day:

- busy with management procedures, and has **no time to supervise** the residents.
- unable to correct the resident's mistakes in time, hindering the learning progress of the residents as well as potentially dangering the patient.

[**Resident conducts upper limb physical examination on Patient *while patient was standing***]

Consultant

If you are doing this, the patient should be seated down.

[**Resident guides patient to sit down and continues examination**]

Resident

Sit down and keep your elbow up. Squeeze my hand.

Patient

Squeeze your hands?

Timestamp
24:30 - 23:39

Insights

1. Consultant must be able to **monitor** all his Resident's actions and interactions to better understand their learning process.

2. If any errors were made by the Resident during his clinical assessments (verbal and physical) and diagnosis, Consultant must be able to **intervene** and correct the Resident in a timely manner.

[**Resident ended his physical examination on the patient and was prepared to give his diagnosis**]

Resident

Basically she is describing more lower back pain which ...

[**Resident was interrupted by the Consultant**]

Consultant

What language are you comfortable with?

Patient

Chinese

[**Consultant re-conducted the entire physical examination, discovering symptoms that Resident missed.**]

Timestamp
36:08 - 36:34

Insights

Consultant needs to be able to **impart** situation-specific clinical skills and knowledge to the residents easily.

Appendix: Market Analysis (Done by : Augustine)

Global **Medical Education Market** is valued at USD 87.57 Billion in 2018,

Growing at a CAGR of 17% from 2018-2022

Key Market Drivers:

- Gamification (including game design elements such as leaderboards to encourage intrinsic learning).
- Increasing enrolment in medical courses.

Source: https://www.bloomberg.com/press-releases/2019-06-26/medical-education-market-worth-usd-87-57-billion-at-17-cagr-during-2018-2022-technavio

Appendix: Market Analysis (Done by : Augustine)

Global Healthcare/Medical **Simulation** Market is Set to Reach USD 4.0 Billion by 2024, Growing at a CAGR of 14.2% During the Forecast Period

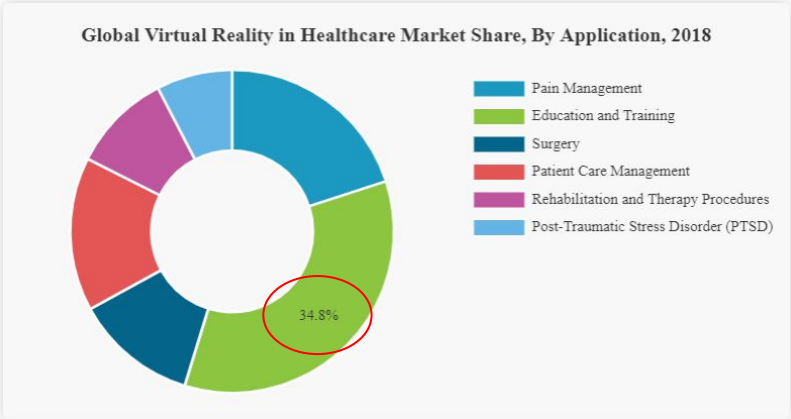
Key Market Drivers:

- Advantages of Simulation over conventional learning
- Increasing emphasis on **patient safety**
- Increasing healthcare expenditures requires hospitals to save resources and funding.
- **Academic institutes** were cited to be accountable for the **largest share** in the medical simulation market

Source:
https://www.globenewswire.com/news-release/2019/07/11/1881265/0/en/Global-Healthcare-Medical-Simulation-Market-is-Set-to-Reach-USD-4-0-Billion-by-2024-Growing-at-a-CAGR-of-14-2-During-the-Forecast-Period-VynZ-Research.html

Appendix: Market Analysis (Done by : Augustine)

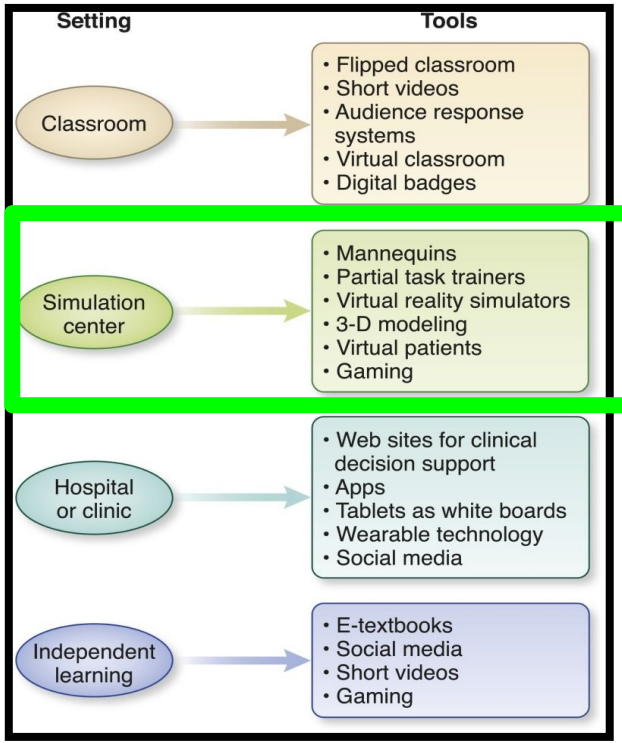
For **VR Healthcare** Market, "USD$ 1.56 Billion in 2018, expected 30.40 billion by 2026, CAGR 42.6%." Out of this, the largest market segment by application is education and training, at 34.8%.



Source: https://www.fortunebusinessinsights.com/industry-reports/virtual-reality-vr-in-healthcare-market-101679

Appendix: Market Analysis (Done by : Eunyu)

Types of Education Tools for the Medical Education Market



Source: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4791817/

X Not effective: the residents spend most of their time in the clinics doing practical work rather than learning in the classroom

✓ **Most effective: able to give residents a hands-on experience to help them to be familiar with real life practices (elaborated on next slide)**

X Not effective: if the residents refer to materials using devices, affects their professionalism and reduces the credibility of the residents as it shows that they are unfamiliar with the patient's symptoms

X Not effective: there is no hands-on learning that is important for the residents to be proficient in clinical assessments

Appendix: Market Analysis (Done by : Augustine)

Simulation is the most effective tool for medical education

- **Contextually applies** important non-technical skills such as teamwork, communication or leadership which are essential in clinical context, rather than just practising medical skills
- **Most practical way of visualisation** for residents to see how their skills can be applied in real life
- **Higher level cognitive and practical skills** are used as they face real life challenges
- Residents are **more motivated to learn** and had a **more meaningful training** with simulation
- **Satisfies the residents' desire** for practice

Source: https://bmcmededuc.biomedcentral.com/articles/10.1186/s12909-019-1509-y
Source: https://www.tandfonline.com/doi/full/10.1080/01421590701551185

Appendix: Patent Analysis (SimX) (Done by : Eunyu)

United States Patent Application *20170213473*
Kind Code **A1**
Ribeira; Ryan Joseph ; et al. **July 27, 2017**

AUGMENTED AND VIRTUAL REALITY SIMULATOR FOR PROFESSIONAL AND EDUCATIONAL TRAINING

Abstract

A method and apparatus for an augmented reality simulator for professional and educational training is provided. The simulator provides a training environment spanning one or more physical locations in which one or more virtual avatars representing purely virtual objects or persons or real physical objects or persons which are located at a different physical location are projected into the physical space. The avatars are interactive with other avatars and real objects or persons and update over time or in response to actions taken by other real or virtual elements, or based on predefined instructions. Sensors and devices are used to detect the locations of and actions taken by real persons or real objects and this sensed data is used to evolve the state of the simulation and avatars based on predefined instructions and programs and update the view of all participants.

Inventors: **Ribeira; Ryan Joseph**; *(Mountain View, CA)* ; **Sarma; Karthik Venkataraman**; *(Los Angeles, CA)* ; **Stadelman, JR.; Stanley Thomas**; *(Livermore, CA)* ; **Namperumal; Srihari Kumar**; *(Belmont, CA)* ; **Ribeira; Jason Robert**; *(Castro Valley, CA)* ; **Miller; Christopher Ryan**; *(Tempe, AZ)*

Applicant:	**Name**	**City**	**State**	**Country**	**Type**
	SimX, Inc.	Mountain View	CA	US	

Assignee: **SimX, Inc.**
Mountain View
CA

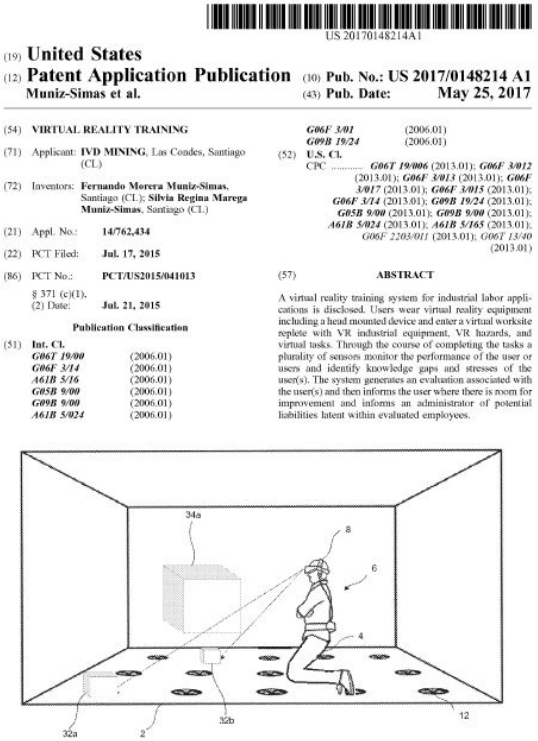
Family ID: **55459494**
Appl. No.: **15/452108**
Filed: **March 7, 2017**

This Figure shows a patent that SimX has filed for in March 2017, of which is still pending approval as of 18th February, 2020.

Current legal status is “Notice of Allowance Mailed”, which indicates that the patent application has been fully reviewed and has been given the green light for patenting, pending the payment of the remaining fees

Source: http://appft1.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PG01&p=1&u=/netahtml/PTO/srchnum.html&r=1&f=G&l=50&s1=20170213473

Appendix: Patent Analysis (Done by : Eunyu)



US 20170148214A1

(19) **United States**

(12) **Patent Application Publication**

Muniz-Simas et al.

(10) **Pub. No.: US 2017/0148214 A1**

(43) **Pub. Date: May 25, 2017**

(54) **VIRTUAL REALITY TRAINING**

(71) Applicant: **IVD MINING**, Las Condes, Santiago (CL)

(72) Inventors: **Fernando Morera Muniz-Simas**, Santiago (CL); **Silvia Regina Marega Muniz-Simas**, Santiago (CL)

(21) Appl. No.: **14/762,434**

(22) PCT Filed: **Jul. 17, 2015**

(86) PCT No.: **PCT/US2015/041013**

§ 371 (c)(1),
(2) Date: **Jul. 21, 2015**

Publication Classification

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G06F 3/14	(2006.01)
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G05B 9/00	(2006.01)
G09B 9/00	(2006.01)
A61B 5/024	(2006.01)
G06F 3/01	(2006.01)
G09B 19/24	(2006.01)

(52) **U.S. Cl.**

CPC ***G06T 19/006*** (2013.01); ***G06F 3/012*** (2013.01); ***G06F 3/013*** (2013.01); ***G06F 3/017*** (2013.01); ***G06F 3/015*** (2013.01); ***G06F 3/14*** (2013.01); ***G09B 19/24*** (2013.01); ***G05B 9/00*** (2013.01); ***G09B 9/00*** (2013.01); ***A61B 5/024*** (2013.01); ***A61B 5/165*** (2013.01); *G06F 2203/011* (2013.01); *G06T 13/40* (2013.01)

(57) **ABSTRACT**

A virtual reality training system for industrial labor applications is disclosed. Users wear virtual reality equipment including a head mounted device and enter a virtual worksite replete with VR industrial equipment, VR hazards, and virtual tasks. Through the course of completing the tasks a plurality of sensors monitor the performance of the user or users and identify knowledge gaps and stresses of the user(s). The system generates an evaluation associated with the user(s) and then informs the user where there is room for improvement and informs an administrator of potential liabilities latent within evaluated employees.

This figure shows a patent filed by EXO Insights Corporation in July 2015.

Current legal status is “Final Rejection Mailed”, which indicates that a final rejection has been issued during the second or subsequent examination of the patent. We have decided to include this in the patent analysis because they have are able to change their publication and resubmit it for approval.

Source:
https://analytics-patsnap-com.libproxy1.nus.edu.sg/patent_view/view?patentId=23dfeee9-6fe0-4695-8851-140132fe626c&sort=sdesc&rows=50&init_route_name=#/23dfeee9-6fe0-4695-8851-140132fe626c/overview/abst

Appendix: Additional (Done by : Eldred Sng)

Technological Simulation Level Typology (proposed by Guillaume Alinier, 2007T): assesses how realistic the simulation can be**.**

Table 1. Proposed typology of simulation methodologies split in 6 levels and with there respective characteristic. Each can either be student or trainer-led.

Technological simulation levels	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
Simulation technique	Written simulations includes pen and paper simulations or "Patient Management Problems'' and latent images	3-D models which can be a basic mannequin, low fidelity simulation models, or part-task simulators	Screen-based simulators Computer simulation, Simulation software, videos, DVDs, or Virtual Reality (VR) and surgical simulators	Standardized patients Real or simulated patients (trained actors), Role play	Intermediate fidelity patient simulators Computer controlled, programmable full body size patient simulators not fully interactive	Interactive patient simulators or Computer controlled model driven patient simulators, also known as high-fidelity simulation platforms
Mode of delivery	Usually student led	Student or trainer led	Student or trainer led	Student or trainer led	Preferably trainer led	Preferably student led
Type	Passive		Interactive		Partly interactive	Interactive
Skills addressed	Cognitive	Psychomotor	Cognitive	Psychomotor, cognitive, and interpersonal	Psychomotor, cognitive, and interpersonal	Psychomotor, cognitive, and interpersonal
Facility required	Classroom	Clinical skills room or classroom	Multimedia/Computer laboratory or classroom	Depends on the scenario requirements	Clinical skills room or simulation centre realistic setting (simulated theatre, ICU, A&E or ward)	Simulation centre with realistic setting (simulated theatre, ICU, A&E or ward) usually set up with audio and video recording equipment
Typical use	Patient manage-	Demonstration and	Cognitive skills Clinical	Same as Level 2	Same as Level 3 plus	Same as Level 4

Source : https://www.tandfonline.com/doi/full/10.1080/01421590701551185

Appendix: Additional (Done by : Eldred Sng)

Typical use	Patient management problems Diagnosis Mainly for assessment	Demonstration and practice of skills	Cognitive skills Clinical management Sometimes interpersonal skills (software allowing for a team to interact over networked computers)	Same as Level 2 plus patient physical assessment, diagnostic, or management problems Interpersonal skills	Same as Level 3 plus procedural skills Full-scale simulation training Sometimes used for demonstrations	Same as Level 4
Disadvantages	Unrealistic Feedback cannot be given instantaneously after the exercise	Limited range of training functions No or little interactivity	Unrealistic setting Students and trainers have to be familiar with the software/ equipment Software has to be kept up to date with the relevant medical regulations/procedures VR sometimes requires very high computational power	For small groups of students only Patients have to be trained and briefed Inconvenient if the exercise has to be repeated many times Not valid for any invasive practice unless used in conjunction with a part-task trainer	May require programming of scenarios Several trainers required for a relatively small group of students Trainers have to be familiar with the equipment Requires an emulated patient monitor for most parameters	Cost (mannequin and facility) Several trainers required for a relatively small group of students Trainers have to be familiar with the equipment Not very portable
Advantages	Low cost (no special equipment required in most cases) One academic may be sufficient for a large number of students	Equipment relatively mobile and always available One academic may be sufficient for a class of students working on the same skill Spares patient discomfort	Relatively low cost, except for VR One academic may be sufficient for a large number of students Students can use it on their own (self learning) Software often provides feedback on performance	Can be very realistic A must for communication skills and patient history taking Allows for truly multiprofesional training	Provides a fairly realistic experience Can be used to apply a broad range of skills Students' performance sometimes recorded Allows for truly multiprofesional training Usually portable	Provides a realistic experience Can be used to apply a broad range of skills Students' performance recorded for debriefing Allows for truly multiprofesional training Can be used with real clinical monitoring equipment

Source : https://www.tandfonline.com/doi/full/10.1080/01421590701551185