Internal Ref: OR20C042

F O R M 2

THE PATENTS ACT, 1970

(39 of 1970)

The patent Rule, 2003

COMPLETE SPECIFICATION

(See section 10 and rule 13)

TITLE OF THE INVENTION

A system for gender analysis based on ultrasound imaging and method thereof

Name and Address of the Applicant:

NAME: Adimatics Healthcare Private Limited
NATIONALITY: Indian
ADDRESS: #16, SLV Layout, Roopena Agrahara,
Bengaluru 560 068, Karnataka, India

Internal Ref: OR20C042

Preamble to the Description

[0001] The following specification describes the invention and the manner in which is to be performed:

DESCRIPTION OF THE INVENTION

Technical field of the invention

[0002] The present invention is related to a system and method for performing gender analysis based on ultrasound imaging during pregnancy and computing the sex ratio at birth. The system has the potential to detect possible gender specific foeticide. One of fundamental steps of the invention is to detect the gender of the fetus using the ultrasound images of the fetus automatically without human intervention using a machine learning algorithm and communicating the same to the authorities in an encrypted manner.

Background of the invention

[0003] According to the United Nations Population Fund, 117 million girls demographically go “missing” due to sex-selective abortions. The sex ratio is defined as the ratio of males to females in a population and is generally expressed as the number of males per 100 females. The sex ratio at birth is usually expressed as the number of boys born alive per 100 girls born alive (OECD, 2010). In China, it is at 115 and in India at 112, despite the laws prohibiting sex identification of fetus and sex-selective abortions are in place, Currently, the gender ratio at 18 to 24 weeks of pregnancy is not available. According to the ACHR report, ultrasound for pre-natal determination of sex can be done for as low as US$ 2.6 in China. In India, ultrasound and abortion can be done for about $150 in India. Thus, it is imperative to detect the gender of the fetus using the ultrasound images of the fetus automatically without human intervention using a machine learning algorithm and communicating the same to the authorities in an encrypted manner.

[0004] According to the invention described in US20140148696 titled ultrasound system and method for providing biometric information of fetus, an ultrasound system and method for providing method for providing biometric information of a fetus, i.e., graphical representation of fetal biometric information are provided. The ultrasound system includes: an ultrasound data acquisition unit that acquires ultrasound data of a living body including a fetus; a storage unit for storing reference information corresponding to each of a plurality of measurement parameters; and a processor that generates an ultrasound image by using the ultrasound data, performs biometric measurement based on the ultrasound image, produces biometric measurement information including biometric measurement parameters of the fetus and their corresponding measurement values, calculates the measurement values as a percentile rank or percent based on the reference information, and creates a graph that represents the biometric measurement information by using the percentile rank or percent. Unlike our invention, it does not focus on gender of the fetus and more specifically automatic detection of gender of the fetus with ultrasound images using machine learning algorithms.

[0005] According to one other invention described in EP2444002 titled 3D ultrasound system for intuitive displaying an abnormality of a fetus and method for operating 3D ultrasound system, a three-dimensional (3D) ultrasound system and a method for operating the 3D ultrasound system are provided, which are capable of intuitively displaying the abnormality of an object, by determining a grade, by comparing measurement data obtained by measuring ultrasound data relating to the object and displaying the measurement data in a different way based on the determined grade. In the current application, the object is a fetus and the measurement data is the NT. Unlike our invention, it does not focus on gender of the fetus and more specifically automatic detection of gender of the fetus with ultrasound images using machine learning algorithm,

[0006] According to yet another invention described in CN109602453 (A) titled Fetal pattern fuzzification processing platform, a fetal pattern fuzzification processing platform is described. The fetal pattern fuzzification processing platform

comprises a B-ultrasound probe, a concentration measuring device, an ethanol alarm device and a parameter setting device; the B-ultrasound probe is used for emitting ultrasound signals and receiving ultrasound signal feedbacks of the emitted ultrasound signals; the concentration measuring device is embedded inside the B-ultrasound probe, and is used for measuring ethanol concentration on the B-ultrasound probe as a real-time ethanol concentration output; the ethanol alarm device is arranged, in connection with the concentration measuring equipment, on one side of the B-ultrasound probe so as to be used for receiving the real-time ethanol concentration; when the real-time ethanol concentration is larger than or equal to a preset threshold, the ethanol alarm device emits an ethanol alarm signal, otherwise, an ethanol qualification signal is emitted; and the parameter setting device is arranged inside a B-ultrasonic instrument, and is used for setting target gender for fuzzification processing under operation of a staff. The fetal pattern fuzzification processing platform can improve flexibility of gender-identification-preventing operations according to one more invention described in. Though it describes fuzzification, the focus is not to detect the gender of the fetus and more specifically automatic detection of gender of the fetus with ultrasound images using machine learning algorithms.

[0007] Accordingly, there is a need for a system and method for performing gender analysis based on ultrasound imaging specially to detect any possible gender specific foeticide and computing the sex ratio in each population as accurately as possible.

Summary of the invention

[0008] It is an object of the invention to detect possible gender specific foeticide based on ultrasound imaging by detecting the gender of fetus initially around 18-24 weeks of the pregnancy and comparing the gender of the baby after the birth.

[0009] One of the methods of the invention includes the following major steps to detect the gender of fetus initially around 18-24 weeks of the pregnancy, store the same in central electronic storage for further analysis, detect the gender of the baby

after the birth and compare to detect gender specific foeticide based on ultrasound imaging.

[0010] In one of the embodiments of the invention, detection of the gender of fetus initially around 18-24 weeks of the pregnancy automatically involves using artificial intelligence methods including deep learning.

[0011] In another embodiment of the invention, the information regarding the gender of the fetus is stored in an encrypted form.

[0012] In yet another embodiments of the invention, the object of the invention is to compute the sex ratio in a population.

Brief description of the drawings

[0013] As the figures are only for the illustrating purpose and not to be construed as limiting cases of the invention or implementation of the invention. It should be remembered that for appropriate variants of the embodiments corresponding to different independent claims figures have been provided accordingly.

[0014] Figure 1 describes an overview of one of the embodiments of system of the invention with the three subsystems.

[0015] Figure 2 explains one of the embodiments of system of the invention further explaining gender registration subsystem in detail.

[0016] Figure 3 narrates another embodiment of the system of the invention further explaining gender submission subsystem in detail.

[0017] Figure 4 portraits one other embodiments of the system of the invention further explaining gender verification subsystem in detail.

[0018] Figure 5 explains possible embodiments of processing means as a part of the system described in the invention.

[0019] Figure 6 explains possible embodiments of electronic storage means as a part of the system described in the invention.

[0020] Figure 7 explains possible embodiments of communication means as a part of the system described in the invention.

[0021] Figure 8 narrates the contents of the details of mother to be stored in electronic means.

[0022] Figure 9 corresponds to the method adapted to the embodiment in Figure 1.

[0023] Figure 10 corresponds to the method adapted to the embodiment in Figure 2.

[0024] Figure 11 corresponds to the method adapted to the embodiment in Figure 3.

[0025] Figure 12 corresponds to the method adapted to the embodiment in Figure 4.

[0026] Figure 13 explains galaxy of methods to be used to detect the gender of fetus from ultrasound imaging using artificial intelligence and statistical inference-based methods.

Detailed description of the invention

[0027] Figure 1 describes an overview of one of the embodiments of system (**100**) for gender analysis using ultrasound images. The system (**100**) comprises three

subsystems namely gender registration system (**130**), gender submission system (**140**) and gender verification system (**150**).

[0028] Figure 2 explains the embodiment of the gender registration system (**130**) as a part of the system (**100**) for gender analysis using ultrasound images as described in Figure 1. The gender registration system (**130**) comprising at least one first processing means (**200**) to process at least one or more ultrasound images (**115**) from the ultrasound system (**110**) to determine the gender (**350**) of a fetus (**300**) automatically, at least one first electronic storage means (**400**) to store the details (**315**) of the mother (**310**) carrying the fetus (**300**) and the gender (**350**) of the fetus (**300**), at least one central electronic storage means (**450**) to store the details (**315**) of the mother (**320**) carrying the fetus (**300**) and the gender (**350**) of the fetus (**300**), and at least one first communication means (**500**) to communicate at least the details (**315**) of the mother (**320**) carrying the fetus (**300**) and the gender (**350**) of the fetus (**300**) from the first electronic storage means (**400**) to the central electronic storage means (**450**).

[0029] Figure 3 describes the embodiment of the gender submission system (**140**) as a part of the system (**100**) for gender analysis using ultrasound images as described in Figure 1. The gender submission system (**140**) comprises at least one second electronic storage means (**410**) to store the details (**315**) of the mother (**310**) carrying the fetus (**300**) and the gender (**360**) of the baby (**300**) at birth, and at least one second communication means (**510**) to communicate at least the details (**315**) of the mother (**310**) carrying the fetus (**300**) and the gender (**360**) of the baby (**300**) at birth from the second electronic storage means (**410**) to the central electronic storage means (**450**).

[0030] Figure 4 deals with the embodiment of the gender verification system (**150**) as a part of the system (**100**) for gender analysis using ultrasound images as described in Figure 1. the gender verification system (**150**) comprises at least one central processing means (**250**) to compare the gender (**350**) of the fetus (**300**) with

the gender (**360**) of the baby (**300**) at birth with the details of the mother (**315**) from the central electronic storage means (**450**) to detect any probable gender specific foeticide (**700**).

[0031] Figure 5 describes possible embodiments of the processing means (**200,210,250**) the system (**100**) for gender analysis using ultrasound images as described in Figure 1. The possible embodiments of the first processing means (200), the second processing means (**200**) or the central processing means (**250**) include multiple processing units (**220**) with or without additional processing units such as graphical processing units (GPU) (**230**), coprocessors such as digital signal processors (DSP) (**240**), Application specific integrated circuits (ASIC) (**250**), field programmable gate array (FPGA) (**260**), and such other parallel and distributed processing units (**270**). It may be recalled that the processing means (**200,210,250**) the system (**100**) have the capability to process any number and resolution of ultrasound images (**115**). It is also presumed that any new processing means are also included in the processing means **(200,210,250**) of the system (**100**).

[0032] Figure 6 describes possible embodiments of the electronic storage means (**400,410,450**) the system (**100**) for gender analysis using ultrasound images as described in Figure 1. The possible embodiments of the first electronic storage means (**400**), the second electronic storage means (**410**) or the central electronic storage means (**450**) include any electronic storage but not limited to hard disks (**420**), magnetic and video tapes (**430**), compact discs (**440**), DVD (**460**), Flash drive (**470**) and other higher storage capacity electronic storage devices (**480**). It may be recalled that the electronic storage means (**400,410,450**) the system (**100**) have the capability to store any number and resolution of ultrasound images along with the details (**315**) of the mother (**310**) carrying the fetus (**300**) with the gender (**350**) and with the gender (**360**) at birth. It is also presumed that any new electronic storage means are also included in the electronic storage means (**400,410,450**) of the system (**100**).

[0033] Figure 7 corresponds to possible embodiments of the communication means (**500,510**) the system (100) for gender analysis using ultrasound images as described in Figure 1. The possible embodiments of the communication means (**500,510**) the system (**100**) include first communication means (**500**) or second communication means (**510**) include but not limited to both wired (**520**) and wireless communication (**530**) such as Transmission Control Protocol (TCP), Internet Protocol (IP), User Datagram Protocol (UDP), Simple mail transport Protocol (SMTP), File Transfer Protocol (FTP), Hyper Text Transfer Protocol Secure (HTTPS), Telnet, Global system for mobile communication (GSM) and general packet radio system (GPRS). It is also presumed that any new communications means are also included in the communication means (**500,510**) of the system (**100**).

[0034] Figure 8 deals with the details (**315**) of the mother (**310**) carrying the fetus (**300**) with the gender (**350**) which includes but not limited to name (**316**), address (**317**), unique identification number (**318**) such as Aadhar or social security number and mobile number (**329**). It may be recalled that any further necessary and relevant information regarding the mother (**310**) such as date of birth, place of birth, parents of the mother (**310**) and names, address, unique identification number of the husband of the mother (**310**) can be added to the details (**315**) of the mother (**310**).

[0035] Figure 9 corresponds to the method adapted to the embodiment in Figure1 which deals with the processes involved in three subsystems namely gender registration system (**130**), gender submission system (**140**) and gender verification system (**150**) of the system (**100**). The steps include registering (**1100**) the gender (**350**) of the baby (**310**) using gender registration system (**130**), submitting (**1200**) the gender (**360**) of the baby (**310**) after the birth using gender submission system (**140**) and verifying (**1300**) the possible gender specific foeticide (**700**) using gender verification system (**150**) which are further explained in subsequent figures.

[0036] Figure 10 corresponds to the method adapted to the embodiment in Figure 2 which deals with the processes involved in gender registration system (**130**) of

the system (**100**). The steps involved in the gender registration system (**130**) of the system (**100**) include processing (**1110**) ultrasound images (**115**) from the ultrasound system (**110**) to determine the gender (**350**) of the fetus (**300**) automatically using the first processing means (**200**), Storing (**1120**) the details (**315**) of the mother (**310**) carrying the fetus (**300**) and the gender (**350**) of the fetus (**300**) preferably in encrypted form in the first electronic storage means (**400**), Communicating (**1130**) at least the details (**315**) of the mother (**320**) carrying the fetus (**300**) and the gender (**310**) of the fetus (**300**) from the first electronic storage means (**400**) to the central electronic storage means (**450**) and Storing (**1140**) the details (**315**) of the mother (**320**) carrying the fetus (**300**) and the gender (**310**) of the fetus (**300**) in the central electronic storage means (**410**).

[0037] Figure 11 corresponds to the method adapted to the embodiment in Figure 3 which deals with the processes involved in gender submission system (**140**) of the system (**100**). The steps involved in the gender submission system (**140**) of the system (**100**) include Storing (**1210**) the details (**315**) of the mother (**310**) carrying the fetus (**300**) and the gender (**360**) of the baby after birth in the second electronic storage means (**410**), Communicating (**1220**) at least the details (**315**) of the mother (**320**) carrying the fetus (**300**) and the gender (**360**) of the baby after birth from the second electronic storage means (**410**) to the central electronic storage means (**450**) and storing (**1230**) the details (**315**) of the mother (**320**) carrying the fetus (**300**) and the gender (**360**) of the baby after birth in the central electronic storage means (**450**).

[0038] Figure 12 corresponds to the method adapted to the embodiment in Figure 4 which deals with the processes involved in gender verification system (**150**) of the system (**100**). The steps involved in the gender verification system (**150**) of the system (**100**) include Detecting (**1310**) the probable gender specific foeticide (**700**) by comparing the gender (**350**) of the fetus (**300**) and gender (**360**) of the baby (**300**) after the birth from the central electronic storage means (**450**) with the details (**325**) of the mother (**320**) carrying the fetus (**300**) using central processing means (**250**) and reporting (**1320**) the gender specific foeticide (**700**) if occurred.

[0039] Figure 13 explains the galaxy of methods to be used to detect the gender of fetus from ultrasound imaging automatically using artificial intelligence and statistical inference-based methods. The steps include processing (**1110**) ultrasound images (**115**) from the ultrasound system (**110**) to determine the gender (**350**) of the fetus (**300**) automatically using the first processing means (**200**) involves at least one artificial intelligent method (**800**) such as machine learning (**810**), deep learning (**820**), artificial neural networks (**830**) or any combination of them (**840**). The processing (**1110**) ultrasound images (**115**) from the ultrasound system (**110**) to determine the gender (**350**) of the fetus (**300**) automatically using the first processing means (**200**) involves at least one statistical inference method (**900**) such as classification method (**910**), regression method (**920**) or any combination of them (**930**) and any combination (**950**) of the artificial intelligence methods and statistical inference methods. The processing (**1110**) ultrasound images (**115**) from the ultrasound system (**110**) to determine the gender (**350**) of the fetus (**300**) automatically using the first processing means (**200**) involves differentiating ultrasound features of external genitalia.

[0040] For the sake of better understanding of the invention, two example scenarios have been mentioned. It should not be construed that the claimed invention of the patent application works only in these scenarios or restricted to the scenarios mentioned in the examples.

Example 1:

[0041] In the first sample case of female foeticide is explained. The gender analysis system (**100**) based on ultrasound imaging system (**110**). The gender registration system (**130**) has processing means (**200**) to process ultrasound images (**115**) from ultrasound system (**110**) to determine gender (**350**) of fetus (**300**) automatically using artificial intelligence methods (**800**) as female (**350**). In the first electronic storage means (**400**) and central electronic storage means (**450**), the details (**315**) of mother (**310**) carrying fetus (**300**) with gender (**350**) as female are stored using the communication means (**500**) to communicate the same from the first electronic

storage means (**400**) to central electronic storage means (**450**). At the birth in the gender submission system (**140**) of the system (**100**) stores (**1210**) the details (**315**) of the mother (**310**) carrying the fetus (**300**) and the gender (**360**) of the baby after birth in the second electronic storage means (**410**). Then it communicates (**1220**) at least the details (**315**) of the mother (**320**) carrying the fetus (**300**) and the gender (**360**) of the baby after birth from the second electronic storage means (**410**) to the central electronic storage means (**450**) to store (**1230**) the same in the central electronic storage means (**450**). Either after birth or 10 months of completion of the gestation of the mother (**310**), the gender verification system (**150**) of the system (**100**) detects (**1310**) the probable gender specific foeticide (**700**) by comparing the gender (**350**) of the fetus (**300**) in this case – female- and gender (**360**) of the baby (**300**) after the birth from the central electronic storage means (**450**) with the details (**325**) of the mother (**320**) carrying the fetus (**300**) using central processing means (**250**). In the event of no birth after the completion of 10 months of gestation of the mother (**310**) or after the birth if the genders differ then the system (**100**) reports (**1320**) the gender specific foeticide (700) as occurred to the authorities.

Example 2:

[0042] The main difference between the first example and the second example is that the mother (**310**) carries multiple fetuses. In such case, for each fetus (**300**) the gender (**351**) of each fetus are stored in the first electronic storage means (**400**) along with the details (**315**) of mother (**310**) carrying fetus (**300**) with gender (**351**). Using the communication means (**500**) the same from the first electronic storage means (**400**) is communicated to central electronic storage means (**450**). If there are lesser number of fetus at the birth, based on the gender of the fetuses lost, gender specific foeticides (**700**) can be determined.

Example 3:

[0043] The scenario is to determine the sex ratio over a period time in the designated population. Assuming the cases described as in example 1 and 2, counting the number of foeticide (**700**) along with the genders over a period of time

by the central processing means (**250**) shall provide the sex ratio. For example, consider from first of January of the year till the end of October of the next year, let all the registrations amount to x boys and y girls during the first year and the number of live births till the end of October of the next year amounts to “Ex” boys and “ Ey” girls. Let the number of legal terminations be “Tx” boys and “Ty” girls. Then, the number of gender specific foeticide is (x – (Ex+Tx)) for the boys and (y – (Ey+Ty)) for the girls. The expected sex ratio as per registrations is ((y/x)*100) girls for 100 boys and the actual sex ratio after birth is ((Ey/Ex)*100) girls for 100 boys.

Internal Ref: OR20C042

Claims:

We Claim:

1. A gender analysis system (**100**) based on an ultrasound imaging system (**110**) further comprising:
    a. At least one gender registration system (**130**);
    b. At least one gender submission system (**140**), and
    c. At least one gender verification system (**150**).

2. The gender analysis system (**100**) based on ultrasound imaging system (**110**) as claimed in claim 1, wherein the gender registration system (**130**) comprising:

    a. At least one first processing means (**200**) to process at least one or more ultrasound images (**115**) from the ultrasound system (**110**) to determine the gender (**350**) of a fetus (**300**) automatically
    b. At least one first electronic storage means (**400**) to store the details (**315**) of the mother (**310**) carrying the fetus (**300**) and the gender (**350**) of the fetus (**300**);
    c. At least one central electronic storage means (**450**) to store the details (**315**) of the mother (**320**) carrying the fetus (**300**) and the gender (**350**) of the fetus (**300**); and
    d. At least one first communication means (**500**) to communicate at least the details (**315**) of the mother (**320**) carrying the fetus (**300**) and the gender (**350**) of the fetus (**300**) from the first electronic storage means (**400**) to the central electronic storage means (**450**).

3. The gender analysis system (**100**) based on ultrasound imaging system (**110**) as claimed in claim 1, wherein the gender submission system (**140**) comprising:

    e. At least one second electronic storage means (**410**) to store the details (**315**) of the mother (**310**) carrying the fetus (**300**) and the gender (**360**) of the baby after birth,

    f. At least one second communication means (**510**) to communicate at least the details (**315**) of the mother (**310**) carrying the fetus (**300**) and the gender (**360**) of the baby after birth from the second electronic storage means (**410**) to the central electronic storage means (**450**).

4. The gender analysis system (**100**) based on ultrasound imaging system (**110**) as claimed in claim 1, wherein the gender verification system (**150**) comprising;

    g. At least one central processing means (**250**) to compare the gender (**350**) of the fetus (**300**) with the gender (**360**) of the baby after birth with the details of the mother (**315**) from the central electronic storage means (**450**) to detect any probable gender specific foeticide (**700**).

5. The gender analysis system (**100**) based on ultrasound imaging system (**110**) as claimed in any of the claims above, wherein the first processing means (**200**), the second processing means (**200**) or the central processing means (**250**) include multiple processing units (**220**) with or without additional processing units such as graphical processing units (GPU) (**230**), coprocessors such as digital signal processors (DSP) (**240**), Application specific integrated circuits (ASIC) (**250**), field programmable gate array

(FPGA) (**260**), and such other parallel and distributed processing units (**270**).

6. The gender analysis system (**100**) based on ultrasound imaging system (**110**) as claimed in any of the claims above, wherein the first electronic storage means (**400**), the second electronic storage means (**410**) or the central electronic storage means (**450**) include any electronic storage but not limited to hard disks (**420**), magnetic and video tapes (**430**), compact discs (**440**), DVD (**460**), Flash drive (**470**) and other higher storage capacity electronic storage devices (**480**).

7. The gender analysis system (**100**) based on ultrasound imaging system (**110**) as claimed in any of the claims above, wherein first communication means (**500**) or second communication means (**510**) include but not limited to both wired (**520**) and wireless communication (**530**) such as Transmission Control Protocol (TCP), Internet Protocol (IP), User Datagram Protocol (UDP), Simple mail transport Protocol (SMTP), File Transfer Protocol (FTP), Hyper Text Transfer Protocol Secure (HTTPS), Telnet, Global system for mobile communication (GSM) and general packet radio system (GPRS).

8. The gender analysis system (**100**) based on ultrasound imaging system (**110**) as claimed in any of the claims above, wherein the details (**315**) of the mother (**320**) includes but not limited to name (**316**), address (**317**), unique identification number (**318**) such as Aadhar or social security number and mobile number (**329**).

9. The gender analysis system (**100**) based on ultrasound imaging system (**110**) as claimed in any of the claims above, further comprises a tracing system to trace the location of the mother (**320**) using the details (**325**) such as mobile number (**329**).

10. A method (**1000**) to detect gender specific foeticide (**700**) using the gender analysis system (**100**) based on ultrasound imaging system (**110**) comprising:

    a. registering (**1100**) the gender (**350**) of the fetus (**310**) using gender registration system (**130**);
    b. submitting (**1200**) the gender (**360**) of the baby (**310**) after the birth using gender submission system (**140**), and
    c. verifying (**1300**) the possible gender specific foeticide (**700**) using gender verification system (**150**).

11. The method (**1000**) to detect gender specific foeticide (**700**) using the gender analysis system (**100**) based on ultrasound imaging system (**110**) wherein registering (**1100**) the gender (**350**) of the fetus (**310**) using gender registration system (**130**) comprising:

    a. Processing (**1110**) ultrasound images (**115**) from the ultrasound system (**110**) to determine the gender (**350**) of the fetus (**300**) automatically using the first processing means (**200**);
    b. Storing (**1120**) the details (**315**) of the mother (**310**) carrying the fetus (**300**) and the gender (**350**) of the fetus (**300**) preferably in encrypted form in the first electronic storage means (**400**);
    c. Communicating (**1130**) at least the details (**315**) of the mother (**320**) carrying the fetus (**300**) and the gender (**310**) of the fetus (**300**) from the first electronic storage means (**400**) to the central electronic storage means (**450**), and
    d. Storing (**1140**) the details (**315**) of the mother (**320**) carrying the fetus (**300**) and the gender (**310**) of the fetus (**300**) in the central electronic storage means (**410**).

12. The method (**1000**) to detect gender specific foeticide (**700**) using the gender analysis system (**100**) based on ultrasound imaging system (**110**) wherein submitting (**1200**) the gender (**360**) of the baby after birth using gender submission system (**140**) comprising:
    a. Storing (**1210**) the details (**315**) of the mother (**310**) carrying the fetus (**300**) and the gender (**360**) of the baby after birth in the second electronic storage means (**410**);
    b. Communicating (**1220**) at least the details (**315**) of the mother (**320**) carrying the fetus (**300**) and the gender (**360**) of the baby after birth from the second electronic storage means (**410**) to the central electronic storage means (**450**), and
    c. Storing (**1230**) the details (**315**) of the mother (**320**) carrying the fetus (**300**) and the gender (**360**) of the baby after birth in the central electronic storage means (**450**).

13. The method (**1000**) to detect gender specific foeticide (**700**) using the gender analysis system (**100**) based on ultrasound imaging system (**110**) wherein verifying (**1300**) the possible gender specific foeticide (**700**) using gender verification system (**150**) comprising:
    a. Detecting (**1310**) the probable gender specific foeticide (**700**) by comparing the gender (**350**) of the fetus (**300**) and gender (**360**) of the baby after the birth from the central electronic storage means (**450**) with the details (**325**) of the mother (**320**) carrying the fetus (**300**) using central processing means (**250**), and
    Reporting (**1320**) the gender specific foeticide (**700**) if occurred.

14. The method (**1000**) to detect gender specific foeticide (**700**) using the gender analysis system (**100**) based on ultrasound imaging system (**110**) as claimed in claims 10-13, in multiple gestation having multiple fetuses (**301**) and the processing (**1110**) includes determining respective genders (**351**) of the multiple fetus (**301**) and the processing (**1210**) includes determining respective genders (**361**) of the babies (**302**) after birth.

15. The method (**1000**) to detect gender specific foeticide (**700**) using the gender analysis system (**100**) based on ultrasound imaging system (**110**) as claimed in claims 10-14, wherein the one or more ultrasound images (**115**) from the ultrasound system (**110**) to determine the gender (**350**) of a fetus (**300**) by processing (**1110**) are taken during the 18 to 24 weeks of pregnancy of the mother (**320**).

16. The method (**1000**) to detect gender specific foeticide (**700**) using the gender analysis system (**100**) based on ultrasound imaging system (**110**) as claimed in any of the claims above, wherein the method computes the sex ratio.

17. The method (**1000**) to detect gender specific foeticide (**700**) using the gender analysis system (**100**) based on ultrasound imaging system (**110**) as claimed in any of the claims above, wherein processing (**1110**) ultrasound images (**115**) from the ultrasound system (**110**) to determine the gender (**350**) of the fetus (300) automatically using the first processing means (**200**) involves at least one artificial intelligent method (**800**) such as machine learning (**810**), deep learning (**820**), artificial neural networks (**830**) or any combination of them (**840**).

18. The method (**1000**) to detect gender specific foeticide (**700**) using the gender analysis system (**100**) based on ultrasound imaging system (**110)** as claimed in any of the claims above, wherein processing (**1110**) ultrasound images (**115**) from the ultrasound system (**110**) to determine the gender (**350**) of the

fetus (**300**) automatically using the first processing means (**200**) involves at least one statistical inference method (**900**) such as classification method (**910**), regression method (**920**) or any combination of them (**930**).

19. The method (**1000**) to detect gender specific foeticide (**700**) using the gender analysis system (**100**) based on ultrasound imaging system (**110**) as claimed any of the claims above, wherein processing (**1110**) ultrasound images (**115**) from the ultrasound system (**110**) to determine the gender (**350**) of the fetus (**300**) automatically using the first processing means (**200**) involves any combination (**950**) of the artificial intelligence methods and statistical inference methods.

20. The method (**1000**) to detect gender specific foeticide (**700**) using the gender analysis system (**100**) based on ultrasound imaging system (**110**) as claimed in any of the claims above, wherein processing (**1110**) ultrasound images (**115**) from the ultrasound system (**110**) to determine the gender (**350**) of the fetus (**300**) automatically using the first processing means (**200**) involves differentiating ultrasound features of external genitalia.

21. The method (**1000**) to detect gender specific foeticide (**700**) using the gender analysis system (**100**) based on ultrasound imaging system (**110**) as claimed any of the claims above, wherein storing (**1120**) in the first electronic storage means (**400**) or storing (**1220**) in the central electronic storage means (**410**) the details (**315**) of the mother (**320**) carrying the fetus (**300**) are stored in an inaccessible form such as encrypted form.

22. The method (**1000**) to detect gender specific foeticide (700) using the gender analysis system (**100**) based on ultrasound imaging system (**110**) as claimed any of the claims above, wherein communicating (**1300**) or (**1500**) the details (**325**) of the mother (**320**) carrying the fetus (**300**) are communicated

in an inaccessible form such as encrypted form or through encrypted channels or networks.

23. The method (**1000**) to detect gender specific foeticide (**700**) using the gender analysis system (**100**) based on ultrasound imaging system (**110**) as claimed in any of the claims above, wherein reporting (**1700**) the probable gender specific foeticide (**700**) if occurred is made only to government and relevant authorities in an inaccessible form such as encrypted form including with passwords.

Bindu Sharma
Agent for the applicant
Regn no: IN/PA 1055
Dated: 8th June 2020

Internal Ref: OR20C042

Abstract

A SYSTEM FOR GENDER ANALYSIS BASED ON ULTRASOUND IMAGING AND METHOD THEREOF

[**0040**] A gender analysis system (**100**) based on ultrasound imaging system (**110**) comprises gender registration (**130**), gender submission (**140**) gender verification (**150**) subsystems. The gender registration system (**130**) has processing means (**200**) to process ultrasound images (**115**) from ultrasound system (**110**) to determine gender (**350**) of fetus (**300**) automatically, first electronic storage means (**400**) and central electronic storage means (**450**) to store details (**315**) of mother (**310**) carrying fetus (**300**) with gender (**350**) and communication means (**500**) to communicate the same from the first electronic storage means (**400**) to central electronic storage means (**450**). The processing (**1110**)of ultrasound images (**115**) to determine gender (**350**) of fetus (**300**) automatically uses artificial intelligent method (**800**) viz. machine learning (**810**), deep learning (**820**), artificial neural networks (**830**) compared with gender of baby after birth to detect possible gender specific foeticide.

(Figure 1)

Bindu Sharma
Agent for the applicant
Regn no: IN/PA 1055
Dated: 8th June 2020