A FEEDING TUBE POSITIONING SYSTEM AND DETECTION METHOD

TECHNICAL FIELD

[0001] The present disclosure generally relates to feeding tubes, such as nasogastric (NG) tubes, nasoduodenal and nasojejunal tubes. The present disclosure also relates to a feeding tube positioning system, a method of manufacturing the feeding tube and a detection method associated with the feeding tube.

BACKGROUND

[0002] The following discussion of the background is intended to facilitate an understanding of the present disclosure only. It should be appreciated that the discussion is not an acknowledgement or admission that any of the material referred to was published, known or is part of the common general knowledge of the person skilled in the art in any jurisdiction as of the priority date of the invention.

[0003] After a feeding tube has been inserted in a body, the use of X-ray based, ultrasound, or the use of pH aspirate-based techniques for the purpose of verifying NG tube placement are known. There are however inadequacies associated with the use of these existing techniques. As these techniques require suitably qualified and trained personnel to conduct them, they typically cannot be used outside of a hospital or medical clinic environment. In addition, current methods of placement do not allow for proper tracking or detection of the movement of a feeding tube after the feeding tube has been inserted into a subject’s body.

[0004] The present disclosure contemplates that it would be desirous to consider one or more other techniques for verifying or detecting feeding tube placement so that more options for such a purpose can be available.

[0005] Accordingly, an object of the disclosure is to provide improvements to the verification and detection of feeding tube.

SUMMARY

[0006] The disclosure is motivated by the need for an improved feeding tube positioning system and the use of a plurality of sensors and control module to guide a user to achieve correct placement of the feeding tube.

[0007] According to an aspect of the disclosure there is a feeding tube positioning system comprising a feeding tube, the feeding tube having a first end and a second end with the second end adapted to be inserted in a subject body part; an electromagnetic wave generator positioned proximate the second end; a control module arranged in data or signal communication with the electromagnetic wave generator; wherein the control module comprises a processor and a plurality of sensors arranged to determine at least one of a relative position of the electromagnetic wave generator and a relative movement of the electromagnetic wave generator based on the signal strength received at each of the plurality of sensors.

[0008] In some embodiments, the feeding tube is a nasogastric tube adapted to be inserted into a stomach portion of a mammalian subject. The mammalian subject may be a human subject.

[0009] According to another aspect of the disclosure there is a method for positioning a feeding tube into a human subject comprising the steps of: a. inserting the feeding tube through an orifice of the human subject; b. activating, via the control module, the electromagnetic wave generator to emit at least one electromagnetic wave; c. detecting, using the plurality of sensors, to determine at least one of a relative position of the electromagnetic wave generator and a relative movement of the electromagnetic wave generator based on the electromagnetic signal detected or received at each of the plurality of sensors, the computation of signal strength of the electromagnetic signal detected or received at the electromagnetic wave generator, and a comparison of the signal strength of the electromagnetic signal; and d. displaying a visual or audio indicator of a current position or a current direction of movement depending on the signal strength.

[0010] According to another aspect of the disclosure there is a non-transitory

computer readable medium having stored thereon software instructions that, when executed by a processor or a dedicated circuit, cause the processor to or dedicated circuit to perform a method of positioning a feeding tube.

[0011] According to another aspect there is a method of manufacturing a feeding tube positioning system comprising the steps of: (a.) providing a feeding tube, the feeding tube having a first end and a second end with the second end adapted to be inserted in a subject body part; (b.) positioning an electromagnetic wave generator proximate the second end; and (c.) providing a control module arranged in data or signal communication with the electromagnetic wave generator; the control module comprises a processor and a plurality of sensors arranged to determine at least one of a relative position of the electromagnetic wave generator and a relative movement of the electromagnetic wave generator based on the signal strength received at each of the plurality of sensors.

[0012] According to another aspect there is a non-transitory computer readable medium having stored thereon software instructions that, when executed by a processor or a dedicated circuit, cause the processor or dedicated circuit to perform a method of positioning a feeding tube in a subject body part comprising the steps of: (a) activating an electromagnetic wave generator positioned on the feeding tube, the feeding tube adapted to be inserted in the subject body; (b) activating a control module arranged in data or signal communication with the electromagnetic wave generator; the control module comprises the processor or dedicated circuit; (c) activating a plurality of sensors arranged to determine at least one of a relative position of the electromagnetic wave generator and a relative movement of the electromagnetic wave generator based on the electromagnetic signal detected or received at each of the plurality of sensors; (d) computing the signal strength of the electromagnetic signal detected or received at the electromagnetic wave generator, and (e) comparing the signal strength of the electromagnetic signal received at each of the plurality of sensors.

[0013] Other aspects and features of the present invention will become apparent to those of ordinary skill in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying

figures.

BRIEF DESCRIPTION OF DRAWINGS

[0014] In the figures, which illustrate, by way of example only, embodiments of the present invention,

[0015] Figure 1 is a system diagram of a feeding tube positioning system according to an embodiment of the present disclosure;

[0016] Figures 2a and 2b respectively show a partial side and a cross-sectional view of a feeding tube in the form of a nasogastric tube according to another embodiment of the present disclosure;

[0017] Figure 3 shows a flow chart of the control module operating in a warning mode according to some embodiments of the present disclosure; and

[0018] Figure 4 shows a flow chart of the control module operating in a scanning mode according to some embodiments of the present disclosure.

DESCRIPTION OF EMBODIMENTS

[0019] As used herein, the term “subject” can be any animals, including mammalian animals and human beings.

[0020] As used herein, the term “associate”, “associated”, “associate”, and “associating” indicate a defined relationship (or cross-reference), correlation between at least two items, parameters, variables, and/or values.

[0021] As used herein, the term “feeding tube” is broadly understood to be a tube for insertion into a subject’s body for facilitating feeding and administering of drugs and other oral agents.

[0022] As used herein, the term “sensor(s)” include hard sensors and soft sensors.

[0023] As used herein, the term “network” can be any means of providing

communication between one or more devices and/or content stored elsewhere. As used herein, network can be a personal area network, local area network, a storage area network, a system area network, a wide area network, a virtual private network, and an enterprise private network. The network can include one or more gateways or no gateways. The network communication can be conducted via published standard protocols or proprietary protocols.

[0024] As used herein, communication of data through any network can be: (i) encoded or unencoded; (ii) encrypted or unencrypted; (iii) delivered via a wired network, a wireless network, or a combination of wired and wireless. Wireless communication can be accomplished in any practical manner including a Wi-Fi 802.11 network, a Bluetooth™ network, or mobile phone network (such as 3G, 4G, LTE, and 5G). The terms “connected”, “connected”, and “connecting” as used herein refer to a communication link between at least two devices and can be accomplished as discussed in this paragraph.

[0025] As used herein, the term “computing device” may be a single stand-alone computer such as a desktop computer or a laptop computer, a thin client, a tablet computer, or a mobile phone. The computing device may run a local operating system and store computer files on a local storage drive. The computing device may access files and application through a gateway to one or more content repositories, the content repository can host files and/or run virtual applications and generate a virtual desktop for the computing device.

[0026] As used herein, the term “server” may include a single stand-alone computer, a single dedicated server, multiple dedicated servers, and/or a virtual server running on a larger network of servers and/or cloud-based service.

[0027] As used herein, the term “database” may include one or more data repositories to store data and access data from a single stand-alone computer, a data server, multiple dedicated data servers, a cloud-based service, and/or a virtual server running on a larger network of servers.

[0028] As used herein, the term “module” may include hardware, software, or combinations thereof to achieve a desired function. For example, a control module

may include the necessary hardware and software to communicate with one or more sensors to send and receive data signals from the one or more sensors, and/or to send control signals to the sensors.

[0029] The present disclosure contemplates an improvement of electromagnetic radiation-based techniques/technologies for the purpose of verifying placement of a feeding tube after the feeding tube has been inserted/positioned in a body of a subject, for example a mammalian body such as a human body).

[0030] Figure 1a shows a feeding tube positioning system having the feeding tube in the form of a nasogastric (NG) tube 100, the NG tube 100 including an electromagnetic generator 110 configurable to generate and transmit one or more electromagnetic signals of a predetermined frequency, and a control module 120 according to an embodiment of the present disclosure. The NG tube 100 can be placed/located within a body 10. It is appreciable that the NG tube 100 and the control module 120 can, in effect, form/constitute a system (i.e., the system can include the NG tube 100 and the control module 120).

[0031] The NG tube 100 can be associated with electromagnetic-based techniques/technologies in that the NG tube 100 position, when within a body 10, can be verified/determined by manner of ultrasound. Specifically, position of at least a portion of the NG tube 100 that is within the body 10 can be verified/determined by manner of electromagnetic-based techniques/technologies.

[0032] The NG tube 100 comprises a tubing 102 can include a first end 102a and a second end 102b. The first end 102a and the second end 102b can define the extremities of the tubing 102. Specifically, the first and second ends 102a/102b can be opposing ends of the tubing 102. It is appreciable that reference to ‘first’ and ‘second’ ends are meant to distinguish the two opposing ends and do not denote any particular order.

[0033] In one example, the tubing 102 can be in the form of an elongated structure. In a more specific example, the tubing 102 can be in the form of a flexible elongated structure. In yet a more specific example, the tubing 102 can be a

flexible elongated structure made of material such as clear thermoplastic polyurethane (TPU) or polyvinyl chloride (PVC).

[0034] Additionally, as shown, when inserted in the body 10, one end (e.g., the first end 102a) of the NG tube 100 can be nearer to the external of the body 10 as compared to another end (e.g., the second end 102b) of the NG tube 100. In a specific example, when the NG tube 100 has been inserted in the body 100a, the first end 102a can be visually perceivable outside of the body 10 whereas the second end 102b is within the subject's body 10 (e.g., within the abdominal portion of the body 10).

[0035] The electromagnetic wave generator is able to produce electromagnetic waves across the spectrum and varying wavelengths and is commonly known device that is not core to the present invention.

[0036] The electromagnetic (EM) radiation generator 110 may be in the form of an EM emitter. The EM generator may include a transducer operatively connected to a power supply (not shown) to generate an EM radiation of a suitable wavelength(s) for detection and/or further processing by the control module 120. The power supply may be connected via a power cable.

[0037] The NG tube 100 can be coupled to a control module 120. The control module 120 can include one or more sensors 124. The control module 120 is operatively arranged in data or signal communication with the electromagnetic wave generator to receive electromagnetic signals and/or other data from the electromagnetic wave generator. The control module 120 may be a handheld computing device.

[0038] The control module 120 comprises a processor 122 and a plurality of sensors 124 arranged to determine at least one of a relative position of the electromagnetic wave generator and a relative movement of the electromagnetic wave generator based on the electromagnetic signal detected or received at each of the plurality of sensors, the computation of signal strength of the electromagnetic signal detected or received at the electromagnetic wave generator, and a comparison of the signal strength of the electromagnetic signal.

[0039] The control module 120 may be or may form part of a handheld device having a user interface 126. The user interface may provide a visual indicator 128 to indicate the relative direction of the feeding tube in the body 10. Optionally, the control module 120 may include one or more audio indicators to provide sound warning(s) to a user when operating in a warning mode, to be elaborated later.

[0040] The plurality of sensors 124 may be grouped or arranged into a first sensor set 124a arranged to detect the relative movement of the electromagnetic wave generator and a second sensor set 124b arranged to detect the relative position of the electromagnetic wave generator.

[0041] In the embodiment shown in Figure 2a and 2b, the first sensor set 124a comprises four sensors 124a1, 124a2, 124a3, 124a4, the four sensors configured to detect a relative movement, that is, a up movement, a down movement, a left movement, and a right movement associated with the NG tube 100 and the electromagnetic wave generator 110 when positioned in the body 10.

[0042] The second sensor set 124b comprises at least one sensor for detection of non-movement of the electromagnetic wave generator 110 for a predetermined period. This means that when the electromagnetic wave generator is directly below the second sensor set, the signal strength will be stronger compared to the four sensors 124a1, 124a2, 124a3, 124a4.

[0043] The first sensor set 124a and the second sensor set 124b may include velocity sensors and/or acceleration sensors, or sensors to measure time of flight (distance).

[0044] The processor 122 is configured to process the received electromagnetic signal(s) in a manner so as to verify the position of the NG tube 100 within the body 10. The processor 122 can be coupled to the plurality of sensors 124 and which can be configured to process the received EM based signal(s) in a manner so as to verify the NG tube 100 position within the body 10. To achieve the same, the processor 122 may be configured to execute software codes and send and receive data signals from each of the sensors 124, the user interface 126 and the visual indicator 128 so as to implement a warning mode and

a scanning mode. The warning mode and scanning mode seeks to verify that the feeding tube remains in position in the desired location (e.g. stomach) before every feed, and to ensure that the NG tube does not displace into the lung or gets entangled in the oesophagus.

[0045] Figures 3 and 4 show a flow chart associated with the warning mode and a flow chat associated with the scanning mode respectively. In the warning mode, signal strength is computed at each of the sensors associated with the first sensor set, wherein if any one of the signal strength detected for the up movement, the left movement, and the right movement of the electromagnetic wave generator is higher than the signal strength detected for the down movement, at least one of an audio or visual warning is generated by the user interface 126 via the visual indicator 128.

[0046] Referring to the flow chart of Figure 3, the warning mode may be implemented in the processor as executable software codes to enable a method 300 of guiding the feeding tube 100 into the subject 10 desired location, such as the stomach region of the subject 10. The method 300 commence with a start process (step s302) to activate the control module 120. The control module 120 may suitably be a handheld device.

[0047] The control module 120 then detects if the electromagnetic wave generator is in signal communication. If not, the user will need to check and ensure that the electromagnetic wave generator 110 is properly connected to the feeding tube 100. The control module 120 is then positioned on a desired location external to the subject 10 body, such as the jugular notch region, and the warning module is activated (step s304) for initialization. The warning mode may be activated via an actuator conveniently positioned on the control module 120, or may be automatically activated upon detection that the feeding tube is in the desired location.

[0048] The control module 120 next activates the electromagnetic wave generator if it was not previously activated, together with the first sensor set comprising the directional finder sensors (step s306).

[0049] It may be appreciated that steps s302, s304 and s306 may be regarded as initialization steps.

[0050] The feeding tube is next inserted to the subject body via an orifice of the subject 10 (step s308). Where the feeding tube is an NG tube, the orifice may be the nostrils of the subject 10. Upon activation, the three sensors of the first sensor set will detect the electromagnetic signal(s) generated by the electromagnetic generator 110 and the detected signals will be computed by the processor 122 to determine the associated signal strength (step s310). Various computation methods used in the art may be used. These include electrical voltage-based methods where detected EM signals are converted to corresponding electrical voltage values correlated to or proportional to the signal strength.

[0051] After the signal strength on each sensor of the first sensor set are computed, the corresponding values of each sensor within the first sensor set are compared with one another (step s312). If the sensor associated with the intended direction has a higher signal strength compared to other sensors, a visual and/or audio indication is provided to the user communicating that the feeding tube is on the right path to the intended location (step s314).

[0052] For example, if the feeding tube is an NG tube, and the sensor associated with the downward movement has the highest signal strength computed, it may be concluded that the feeding tube is in on the right path to the desired location, such as the stomach.

[0053] However, if any of the sensors associated with the non-intended direction is determined to have a higher signal strength compared to the sensor associated with the intended direction, then a visual and/or audio indication is provided to the user communicating that the feeding tube is wrongly inserted into a region (step s316).

[0054] For example, if the feeding tube is an NG tube, and the sensor associated with the left or right direction has a higher computed signal strength compared to the sensor associated with the downward direction, it may be concluded that the NG tube is wrongly inserted into the left or right lung. The user

will then be prompted to remove the feeding tube from the subject body (step s318) and restart the process, back to step s302.

[0055] At step s314, the warning mode process may be ended (step s320) if the NG tube is determined to be in the final position. The warning mode may also be ended at anytime as determined by a user.

[0056] In summary, the warning mode is activated to monitor a possible event that the feeding tube (NG tube) enter the larynx and trachea instead of the oesophagus, and the warning mode will warn the user that the NG tube may have entered the lung through the left or right bronchus. After receiving the warning, the user can pull out the NG tube and prevent pneumothorax that can endanger the subject.

[0057] If the NG tube is however inserted into the oesophagus correctly on the pathway to the stomach, the device will alert user that the NG tube is moving downward.

[0058] It is contemplated that the warning mode may be implemented for different types of feeding tubes, including but not limited to Orogastric tube

[0059] Referring to the flow chart of Figure 4, the scanning mode may be implemented in the processor as executable software codes to enable a method 400 of determining whether the feeding tube 100 is correctly positioned within the desired location, such as the stomach region of the subject 10.

[0060] This stems from the importance to determine that the NG tube is in the stomach before feeding takes place. The scanning mode is utilized in at least two scenarios as follows: (a) to verify NG tube is in position in the stomach and (b) ensure the NG tube does not coil and stuck in the oesophagus (after warning mode).

[0061] The method 400 commence with a start process (step s402) to activate the control module 120. As previously indicated, the control module 120 may suitably be a handheld device.

[0062] The control module 120 then detects if the electromagnetic wave generator is in signal communication. If not, the user will need to check and ensure that the electromagnetic wave generator 110 is properly connected to the feeding tube 100. The control module 120 is then positioned on a desired location external to the subject 10 body, such as the xiphoid process region, and the scanning module is activated (step s404) for initialization. The scanning mode may be activated via an actuator conveniently positioned on the control module 120, or may be automatically activated upon detection that the feeding tube is in the desired location or after the completion of the warning mode.

[0063] The control module 120 next activates the electromagnetic wave generator if it was not previously activated, together with the first sensor set and second sensor set comprising the directional finder sensors and the location sensors (step s406).

[0064] It may be appreciated that steps s402, s404 and s406 are initialization steps.

[0065] Upon activation, the sensors of the first sensor set and the second sensor set will detect the electromagnetic signal(s) generated by the electromagnetic generator 110 and the detected signals will be computed by the processor 122 to determine the associated signal strength (step s408). As mentioned previously, various computation methods used in the art may be used. These include electrical voltage-based methods where detected EM signals are converted to corresponding electrical voltage values correlated to or proportional to the signal strength.

[0066] After the signal strength on each sensor of the first sensor set and second sensor set are computed, the corresponding values of each sensor within the first sensor set are compared with the sensor in the second sensor set (step s410). If the sensor associated with the location/position has a higher signal strength compared to other sensors, a visual and/or audio indication is provided to the user communicating that the feeding tube is or remains in the final position (step s412).

[0067] For example, if the feeding tube is an NG tube, and the sensor associated with the location has the highest signal strength computed, it may be concluded that the feeding tube is at the desired location, such as the stomach.

[0068] However, if any of the sensors associated with the direction is computed or determined to have a higher signal strength compared to the sensor associated with the location or position, then the control module determines the sensor in the first sensor set that is associated with the highest signal strength (step s414) and alerts the user on the general direction associated with the strongest signal strength (step s416).

[0069] For example, if the feeding tube is an NG tube, and the sensor associated with the down direction has a highest computed signal strength compared all the other sensors associated with direction, and in addition the highest computed signal strength is higher than the signal strength associated with the location/position sensor, it may be concluded that the NG tube is moving towards the downwards direction, and suitable adjustment is required by the user to either follow the downward direction or otherwise.

[0070] At step s412, the scanning mode process may be ended (step s420) if the NG tube is determined to be in the final position. The scanning mode may also be ended at any time as determined by a user.

[0071] In summary, the scanning mode seeks to provide an indication of the final position of the feeding tube, whether the feeding tube has moved from the final position, and whether the feeding tube is stationary.

[0072] It is contemplated that the control module 120 can be configured to further communicate the received EM signal(s) to one or more computers (not shown) for processing in a manner so as to verify the NG tube 100 position. The control module 120 can, for example, be coupled to the computer(s) by manner of one or both of wired coupling and wireless coupling.

[0073] In yet another embodiment, the control module 120 can be configured to process the received EM signal(s) and further communicate the received EM

signal(s) to one or more computers (not shown) for processing.

[0074] Generally, the received EM signal(s) can be processed in a manner so as to verify the NG tube 100 position (i.e., within the body 10). In a specific example, the received EM signal(s) can be processed in a manner so as to verify /determine the position of at least a portion of the NG tube 100 (e.g., the second end 102b) that is within the body 10.

[0075] In a general example, the control module 120 can be configured to generate one or both of at least one audio-based output signal and at least one graphical based output signal for indicating the NG tube 100 position (i.e., within the body 10). It is to be appreciated that the control module 120 can further include at least one output portion (for example, a speaker driver and/or a screen).

[0076] Another aspect of the present disclosure is a method for positioning a feeding tube 100 into a human subject comprising the steps of: a. inserting the feeding tube through an orifice of the human subject; b. activating, via the control module, the electromagnetic wave generator to emit at least one electromagnetic wave; c. detecting, using the plurality of sensors, to determine at least one of a relative position of the electromagnetic wave generator and a relative movement of the electromagnetic wave generator based on the electromagnetic signal detected or received at each of the plurality of sensors, the computation of signal strength of the electromagnetic signal detected or received at the electromagnetic wave generator, and a comparison of the signal strength of the electromagnetic signal; and d. displaying a visual or audio indicator of a current position or a current direction of movement depending on the signal strength. Where the feeding tube is a nasogastric tube, the method may further comprise the step of moving the nasogastric tube toward a stomach portion of the human subject.

[0077] The method may utilize the warning mode and/or the scanning mode as earlier described.

[0078] According to another aspect of the present disclosure there is a method of manufacturing a feeding tube positioning system comprising the steps of: (a.) providing a feeding tube, the feeding tube having a first end and a second end with

the second end adapted to be inserted in a subject body part; (b.) positioning an electromagnetic wave generator proximate the second end; and (c.) providing a control module arranged in data or signal communication with the electromagnetic wave generator; the control module comprises a processor and a plurality of sensors arranged to determine at least one of a relative position of the electromagnetic wave generator and a relative movement of the electromagnetic wave generator based on the signal strength received at each of the plurality of sensors.

[0079] According to another aspect of the present disclosure there is a non-transitory computer readable medium having stored thereon software instructions that, when executed by a processor or a dedicated circuit, cause the processor or dedicated circuit to perform a method of positioning a feeding tube in a subject body part comprising the steps of: activating an electromagnetic wave generator positioned on the feeding tube, the feeding tube adapted to be inserted in the subject body; activating a control module arranged in data or signal communication with the electromagnetic wave generator; the control module comprises the processor or dedicated circuit; activating a plurality of sensors arranged to determine at least one of a relative position of the electromagnetic wave generator and a relative movement of the electromagnetic wave generator based on the electromagnetic signal detected or received at each of the plurality of sensors; computing the signal strength of the electromagnetic signal detected or received at the electromagnetic wave generator, and comparing the signal strength of the electromagnetic signal received at each of the plurality of sensors.

[0080] The non-transitory computer readable medium may be a data storage medium having read-only memory (ROM), random access memory (RAM). In some embodiments, the non-transitory computer readable medium may form part of a mobile computing device.

[0081] Throughout the description, it is to be appreciated that the term ‘processor’ and its plural form include microcontrollers, microprocessors, programmable integrated circuit chips such as application specific integrated circuit chip (ASIC), computer servers, electronic devices, and/or combination thereof

capable of processing one or more input electronic signals to produce one or more output electronic signals. The processor includes one or more input modules and one or more output modules for processing of electronic signals.

[0082] Unless defined otherwise, all technical and scientific terms used herein have the same meaning as is commonly understood by a skilled person to which the subject matter herein belongs.

[0083] It should be further appreciated by the person skilled in the art that variations and combinations of features described above, not being alternatives or substitutes, may be combined to form yet further embodiments falling within the intended scope of the invention.

CLAIMS

1. A feeding tube positioning system comprising

a feeding tube, the feeding tube having a first end and a second end with the second end adapted to be inserted in a subject's body;

an electromagnetic wave generator positioned proximate the second end; and

a control module arranged in data or signal communication with the electromagnetic wave generator; the control module comprises a processor and a plurality of sensors arranged to determine at least one of a relative position of the electromagnetic wave generator and a relative movement of the electromagnetic wave generator based on the electromagnetic signal detected or received at each of the plurality of sensors, the computation of signal strength of the electromagnetic signal detected or received at the electromagnetic wave generator, and a comparison of the signal strength of the electromagnetic signal.

2. The feeding tube positioning system of claim 1, wherein the control module is in the form of a handheld device.

3. The feeding tube positioning system of claim 1 or 2, wherein the plurality of sensors comprises a first sensor set arranged to detect the relative movement of the electromagnetic wave generator and a second sensor set arranged to detect the relative position of the electromagnetic wave generator.

4. The feeding tube positioning system of claim 3, wherein the first sensor set comprises four sensors, the four sensors configured to detect an up movement, a down movement, a left movement, and a right movement of the electromagnetic wave generator.

5. The feeding tube positioning system of claim 3 or 4, wherein the second sensor set comprises at least one sensor for detection of non-movement of the electromagnetic wave generator for a predetermined period.

6. The feeding tube positioning system of any one of the preceding claims, wherein the electromagnetic wave is any electromagnectic wave found in the electromagnetic spectrum.

7. The feeding tube positioning system of any one of the preceding claims, wherein the feeding tube is a nasogastric (NG) tube, a Orogastric (OG) tube, a nasojejunal (NJ) tube.

8. The feeding tube positioning system of any one of the preceding claims, wherein the sensors correspond to the type of electromagnetic wave being used.

9. The feeding tube positioning system of any one of claims 3 to 5, wherein the signal strength computed at each of the plurality of sensors is compared to determine a current position and/or an intended movement of the electromagnetic wave generator.

10. The feeding tube positioning system of claim 4 and 9, wherein the control module is configured to operate in a warning mode and a scanning mode.

11. The feeding tube positioning system of claim 10, wherein in the warning mode the signal strength is computed at each of the four sensors associated with the first sensor set, wherein if any one of the signal strength detected for the up movement, the left movement, and the right movement of the electromagnetic wave generator is higher than the signal strength detected for the down movement, at least one of an audio or visual warning is generated.

12. The feeding tube positioning system of claim 10, wherein in the scanning mode the signal strength is computed for each of the four sensors associated with the first sensor set and the at least one sensor in the second sensor set, wherein if any one of the signal strength detected for the up movement, the left movement, the right movement, and the down movement of the electromagnetic wave generator is lower than the signal strength detected for the locator sensor, an audio or visual indication of the final position of the feeding tube is provided.

13. The feeding tube positioning system of claims 11 and 12, wherein the warning mode is activated before the scanning mode.

14. A method for positioning a feeding tube of any one of claims 1 to 13 into a human subject comprising the steps of:

a. inserting the feeding tube through an orifice of the human subject;

b. activating, via the control module, the electromagnetic wave generator to emit at least one electromagnetic wave;

c. detecting, using the plurality of sensors, to determine at least one of a relative position of the electromagnetic wave generator and a relative movement of the electromagnetic wave generator based on the electromagnetic signal detected or received at each of the plurality of sensors, the computation of signal strength of the electromagnetic signal detected or received at the electromagnetic wave generator, and a comparison of the signal strength of the electromagnetic signal; and

d. displaying a visual or audio indicator of a current position or a current direction of movement depending on the signal strength.

15. The method of claim 10, further comprising the step of moving the nasogastric tubing toward a stomach portion of the human subject.

16. The method of claim 14, wherein the control module is configured to operate in a warning mode and a scanning mode.

17. The method of claim 16, wherein in the warning mode the signal strength is computed at each of the sensors associated with a corresponding direction of movement of the electromagnetic wave generator, wherein if any one of the signal strength computed for the sensors associated with an non-intended direction is higher than the signal strength computed for the down movement, at least one of an audio or visual warning is generated.

18. The method of claim 16, wherein in the scanning mode the signal strength is computed for each of the sensors associated with a first sensor set and at least one locator sensor in a second sensor set, wherein if any one of the signal strength computed for the sensors associated with an non-intended direction is higher than

the signal strength computed for the down movement is lower than the signal strength detected for the at least one locator sensor, an audio or visual indication of the final position of the feeding tube is provided.

19. A method of manufacturing a feeding tube positioning system comprising the steps of:

(a.) providing a feeding tube, the feeding tube having a first end and a second end with the second end adapted to be inserted in a subject body part;

(b.) positioning an electromagnetic wave generator proximate the second end; and

(c.) providing a control module arranged in data or signal communication with the electromagnetic wave generator; the control module comprises a processor and a plurality of sensors arranged to determine at least one of a relative position of the electromagnetic wave generator and a relative movement of the electromagnetic wave generator based on the signal strength received at each of the plurality of sensors.

20. A non-transitory computer readable medium having stored thereon software instructions that, when executed by a processor or a dedicated circuit, cause the processor or dedicated circuit to perform a method of positioning a feeding tube in a subject body part comprising the steps of:

activating an electromagnetic wave generator positioned on the feeding tube, the feeding tube adapted to be inserted in the subject body;

activating a control module arranged in data or signal communication with the electromagnetic wave generator; the control module comprises the processor or dedicated circuit;

activating a plurality of sensors arranged to determine at least one of a relative position of the electromagnetic wave generator and a relative movement of the electromagnetic wave generator based on the electromagnetic signal detected or received at each of the plurality of sensors;

computing the signal strength of the electromagnetic signal detected or received at the electromagnetic wave generator, and

comparing the signal strength of the electromagnetic signal received at each of the plurality of sensors.