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Link to Claims Section

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Method of and apparatus for improving research and/or communication interaction with animals such as dolphins and the like, and providing more facile communication with humans lacking speaking capability

INVENTOR: Rines, Robert H. - Concord, New Hampshire, United States (US)

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ENGLISH-ABST:

A novel method and microprocessor-controlled apparatus are provided for improving research and/or communication interaction between human and animals, such as dolphins and the like, or between normal humans and speech-impaired humans, by playing back audible pre-recorded human-language phrases corresponding to and descriptive of the meaning of sounds and/or gestures or responses produced by the animal or the speech-impaired human and in response to stimuli, conditions or environmental events to which the animal (or impaired human) is subjected, wherein the pre-recorded phrases represent what the human would say or describe if subjected to such stimuli, conditions or environmental events; such that during actual real-time interacting with the animals (or such impaired humans) one actually hears "from" the animal or speech-impaired human, spoken language phrases descriptive of their condition.

EXMPL-FIGURE: 3

NO-DRWNG-PP: 7

SUMMARY:

[0001] The present invention relates generally to research, training and communication interaction between humans and particularly the more intelligent and communicative of animals, such as dolphins and the like, being also concerned with humans impaired in speaking capability; the invention having more specific concern with converting studied animal or human sounds, gestures, responses, reflexes or movements produced during and associated with different specific behavioral actions, functions, responses or intentions, into human-language words and phrases descriptive of such, so that the researcher or communicator is put in a more useful posture of actual language "communication" as to the meaning of the sounds, gestures, responses or movements as they are produced in real time.

BACKGROUND

[0002] Many studies have been conducted with intelligent, responsive and expressive animals, such as dolphins, whales, chimpanzees, gorillas and others, trying to bridge the gap of communication, understanding and interaction with humans. Distinctive audible "clicks" and chirps and other tones have been observed with dolphins in various functional pursuits and responses and such, indeed, have been used to identify some elements of behavior including in popular movies and television programs, such as the noted "Flipper" programs. (See, also, V. M. Janik, Science, Vol. 289,1355 (2000)). The "songs" of whales have been recorded and associated with courting, distress and other behavioral conditions. Somewhat similar sound emissions have also been noted with chimps and other primates, some of which have been stimulated to carry out elementary logic functions.

[0003] In all these efforts, however, the human researcher, trainer or communicator, in real-time interaction with the animals, has to re-interpret continually the various familiar sounds or gestures or movements as the animals prepare to perform or do behavioral or responsive patterns associated therewith. If only the animal could tell the human in human language each time it was performing, about to perform, responding to, or intending to embark on some behavioral pattern, or was reacting to conditions or stimuli, the researcher, trainer and/or communicator could be put on a new level of starting point to proceed onward in the interaction.

[0004] It is toward this end that the present invention is accordingly directed; the invention, in effect, putting human language utterances descriptive of the animal feelings, condition, needs, action or response effectively "in the mouth" of the animals[mdash]or at least making it seem so, for all intents and purposes.

[0005] Perhaps more importantly, moreover, the invention also enables more facile "communication" with speech-impaired humans who are deficient at least in speaking capability.

OBJECTS OF INVENTION

[0006] It is thus an object of the present invention to provide a new and improved method of and apparatus for improving interactive communication with such intelligent animals as dolphins and the like, through a technique of first correlating specific animal sounds, gestures, responses, reflexes, or behavioral movements with corresponding particular conditions, environmental stimuli, conduct, emotion or responses of the animals, and associating such with corresponding human language sets of words and phrases descriptive thereof; and then emitting such words as if actually "spoken" to the observer by the animal as the animal subsequently produces such sounds, gesture, responses, reflexes or movements in real time as indications of intentions.

[0007] A further object is to provide such novel "communication" by a technique that is readily generally adaptable to other intelligent beings, as well[mdash]most importantly to humans with speech impairment or incapability; and certainly, also, to other animals than dolphins that have varying degrees of interactable intelligence.

[0008] Still another object is to provide an improved facile computer microprocessor-controlled apparatus of this

character that gives great flexibility in producing video/audio recordings with such "talking" animals.

[0009] Other and further objects will be detailed hereinafter and are more fully delineated in the appended claims.

SUMMARY

[0010] In summary, however, from one of its aspects, the invention embraces a method of improving communication and understanding between humans capable of speaking and listening to audible language words and phrases of human-cognitive intelligent meaning, and animals, such as dolphins, capable of producing varied signals including gestures and emitted sounds of human-audible, detectable frequencies and frequencies outside the human-audible range and that are associated with varied animal behavioral functions, responses and intentions, the method comprising, sensing, monitoring and storing varied animal signals including patterns of gestures and/or animal sounds, while observing the corresponding simultaneous varied behavioral functions, responses and intentions associated substantially with such signals and patterns; correlating the stored signals including the sound patterns as observed to be associated with the corresponding behavioral functions, responses and intentions, and creating a stored library data base therefrom; recording in audible human language, sets of words and phrases correspondingly descriptive of what a human might generally audibly say or describe if it were the human who was performing the same behavioral functions, responses and intentions; correlating the varied human language recordings with the varied correlated stored animal signals and patterns in the data base corresponding to those behavioral functions, responses and intentions; associatively storing the correlated recorded human sets of words and phrases in the data base; and, during subsequent real-time interacting with such animals, or studying visual recordings thereof, automatically playing back audibly the correlated recorded set of human words and phrases identifying the animal's actual performance of the corresponding behavioral function, response and intention.

[0011] As before stated, the use of the technique of the invention also shows promise in improved communication with incapacitated humans deficient in speaking capability.

[0012] Preferred techniques and apparatus design and best modes for the same are hereinafter explained.

DRWDESC:

DRAWINGS

[0013] The invention will now be described in connection with the accompanying drawings, FIG. 1 of which is a combined operational block and flow diagram illustrating the operation of the invention;

[0014]FIG. 2 is a block circuit diagram of preferred apparatus for carrying out the method of the invention with sound emissions from an animal or speaking-impaired human;

[0015]FIG. 3 is a similar diagram for responding to sensed body or body part movement, gestures or body language;

[0016]FIG. 4 is a photograph of correlating observations in Islemarada, Fla. of dolphins assisting in research preparations of the Academy of Applied Science for their then intended underwater research at Loch Ness, Scotland, with flashing light-elapsed time camera and sonar-triggering apparatus supported in harness assemblies; (See Technology Review (MIT), August/September, 1979, p. 3);

[0017]FIG. 5 is a photograph of the dolphin trained to conduct a behavioral response of leaping out of the water to take a picture by the camera of FIG. 4 of the trainer; and

[0018]FIG. 6 is a block diagram of an illustration of combined usage of the systems of FIGS. 2 and 3.

DETDESC:

DESCRIPTION OF PREFERRED EMBODIMENT(S)

[0019] Referring to the flow diagram of FIG. 1, the invention, as before summarized, contemplates creating an extensive stored data base of signals representing sounds and/or gestures, movements or body "language" produced by the subject, such as an intelligent animal or a speech-impaired human, as by video-monitoring or otherwise observing and noting varied behavioral functions, responses, reactions and/or indicated intentions and the like of the subject as in step A, and correlating the sound patterns (step B) and the gesture or body language patterns (step C) with such behavioral functions. A table of such correlations is stored in memory 10-10[prime], FIG. 2, or 20-20[prime], FIG. 3 (step D, FIG. 1) of a microprocessor chip 1, FIG. 2, and/or 1[prime], FIG. 3, respectively, as an accessible look-up table.

[0020] Customary sets of words or phrases, that humans would normally say or describe if it were they who were performing these differing behavioral functions, responses, or intentions and the like, are recorded (step F, FIG. 1), correlated (step G) with the corresponding behavioral functions, etc. and stored in memories 10-101, FIG. 2 and/or 20-201, FIG. 3. Upon determining a correlation or match, the corresponding pre-recorded set of words and phrases of human language are accessed and retrieved (step K) in the memory 10-1011 and 20-2011 of respective FIGS. 2 and 3, and simultaneously audibly played back (step L) through the loudspeaker(s) 14 (141) during the subsequent performing of the behavioral functions, etc., as if the subject were speaking the same. The volume of the playback may be adjusted (amplifier 12, FIG. 2) to mask or override the actual natural subject-emitted sounds so that the illusion of actual human language communication or speaking is created, particularly when the sensing, storage and playback components are positioned on the "person" of the animal so that the "speaking" comes from the animal.

[0021] As before explained, this "speaking" raises the posture of the real-time trainer and/or communicator to a level of further exploration and interaction, without having to re-interpret the meaning of previously observed behavioral functions, responses, etc. It also makes it more comfortable and easier to relate to the subject.

[0022] The exemplary implementation, parts of which in FIGS. 2 and 3 were earlier referenced, involves a sound sensor or monitor microphone(s) 2, FIG. 2, for picking up the emitted sound signals of the subject during performing the behavioral functions, responses, etc. and applying the same to a detector or receiver 4 for analyzing the received sound pattern and feeding along path 3 to a comparator 6 for seeking possible correlation with a sound pattern earlier stored in the look-up table data base 10-101 and applied to the comparator by path 7. Where super-audible sounds are emitted, a well-known heterodyne receiving circuit may beat the same down to the audible range as at HR. In the case of whale or other sub-audible animal sounds, these may also be heterodyned up to the audible range. If there is a match or correlation at 6, an output signal is fed at 5 to the part of the microprocessor memory 10-1011 where the correlated word and phase sets are stored, to select and access the corresponding appropriate word and phrase set which, as retrieved at 9 and fed through amplifier 12, is audibly played as words through loudspeaker 14. By locating such loudspeaker as an implant on the animal, such as on a dolphin as shown in FIG. 2, or near the head of a speech-impaired human, the words will seem to emanate from the respective subjects themselves.

[0023] By similar token, in connection with sensing and monitoring gestures, movements and body language associated with correlated behavioral functions, etc., movement transducer sensors 21 are provided, associated with the microprocessor chip, FIG. 3, and applied, for example, to different parts of the body (shown at 11B near the dolphin mouth in FIG. 3 and near the head at 11A and neck at 11C, for example; and near the eyelid or eye at 11A1 for the speech-impaired human, at the forehead 11B1, ear 11C1, mouth 11H1, neck 11D1, shoulder 11E1, arm-elbow 11I1, hand 11F1 and stomach 11G1[mdash]all as exemplary locations on the "person"). Correlation at 61 of sensed body part

movements with behavioral patterns stored in the table at 20-201 will achieve retrieval from the pre-recorded memory bank 20-2011 of the appropriate human language words, and play-back through the amplifier 121 driving loudspeaker 141. The plurality of sensors may have separate chips or all use a common chip, as shown; and a single chip and loudspeaker 141 may service multiple sensors placed at different parts of the body, the sensor signals being transmitted as by radio (wireless), infrared or other communicating transmission to the signal receiver and analyzer 41 of the chip.

[0024] As shown in FIG. 6, moreover, both sounds and gestures may be monitored together as well as separately by operation of switches S-S1, and with a list, for example, of dolphin sound and gesture and/or body language actions noted to be correlated with corresponding behavioral functions, some of which were earlier noted in said Academy of Applied Science Islamorada tests, being presented in Tables A and B below as illustrations: 1TABLE AObserved CorrelatedCorrelated Created HumanObserved and/or DetectedFunction, Response orVoice Recording ForDistinctive Sound PatternIntentionPlayback1. After towing a dingy by1. Conditioned for fish to be fed1. "I'd like my fish". (Stored inrope, dolphin head surfaced with(stored in look-up table 101, FIG.1011, FIG. 2)a single clack in audible2)frequency range (microphone 2,FIG. 2)2. Submerging horizontally and2. Either about to swim away2. "I'm taking off".then starting frequency -close to and along an(1011)modulated pulsing in 35-40 kHzembankment or in closerange - apparently sonarformation with another dolphin(microphone 2 and heterodynereceiver HR associated withsound pattern analyzer 4, FIG. 2)Observed Distinctive Gesture orObserved Behavioral Function orBody LanguageIntention1. After towing dinghy by rope,1. Conditioned for fish as1. "I'll pull you further whennudging side of dinghy by headprelude to picking up rope inyou feed me fish".and surfacing while openingmouth and continuing towingmouth (angles of about 20-30[deg])and single clack2. With permanent harness2. Total slow-down of2. "I'm not comfortable carryingassembly around head in back ofswimming and in followingthis equipment in this position".eyes, carrying flash camera andconditioned travel sequencessonar trigger cylinders, restrictedunderwater swimmingconsistently at or under [frac12] knot3. Picking up a voluntary3. a) Ready picking up of harness3. a) "I'll pick up the gear andcamera-carrying assembly afterwith equipment (camera)explore underwater".noting the voluntary nature of itsassembly and swimming into itready applying and dropping,and underwater with same (Seeand underwater swimmingTechnology Review article,resuming at [equals]/>3 knots with thesupra)camera assemblyb) Ready self-removing ofb) "Enough for now."harness assembly to floatthe equipment4. Eyelid blinking at flashing rate4. Slow travel; sluggish4. "This flashing light isof carried strobe rapid elapsed-bothering me."time camera (once/per 3seconds)5. Fast travel as if no flashing5. Normal fast travel, ignoring5. "I'm comfortable with theequipment were being carriedcarried equipmentequipment. No bother."upon adjusting harness-strappedcamera to nearer belly6. Upon hand signal, vertical6. Breaking water in vertical6. "Taking your picture."jump out of water directly inposture facing trainer (FIG. 5)front of trainer carryingautomatic camera assemblyfacing trainer.

[0025]2TABLE BFew Exemplary Sound and/or Gesture Correlations With Behavioral Function,Condition, Response Expression and/or Intention, And Corresponding HumanVoice Recordings For Playback.Speech-Incapacitated HumanBehavioral Function ConditionCorrelated Human VoiceSound And/Or Gesture PatternResponse, IntentionRecording For Playback1A. Wincing (sensors 11H1 and1. Stomach ache1. "I have stomach pains"11 B1, FIG. 3) accompanied by("upset tummy").stomach muscle contractions(sensor 11G1) and/or hand onstomach (sensor 11F1)1B. Low grunt or groan sounds1. Stomach ache1. "I have stomach pains"(microphone 2, FIG. 2) while("upset tummy").stomach muscle contractions(sensor 11G1, FIG. 3)2. Scowling (11B1)2. Headache2. "My head aches".3. Squinting (eye sensors 11A1,3. Bright light disturbance3. "The light's bothering me".FIG. 3)4. Grasping one arm with other4. Bumping elbow or arm cramp4. "My arm (elbow) hurts".hand (sensor 11I1, FIG. 3) and/orgroan (microphone 2, FIG. 2)5. Flexing neck (sensor 11D1,5. Neck strain or kink5. "My neck is stiff".11E1, FIG. 3) and rubbing withhand (sensor 11F1)6. Waving arm in simulated6. Intends or wants to play6. "I'd like to play tennis (golf orswingtennis (golf, or swim)swim)."

[0026] From a less significant viewpoint, but perhaps a commercially interesting tack, elementary sounds from apparently less intelligent animals, such as cats and dogs, etc., may be similarly used to develop "speaking" toy attachments to collars for pleasing the owners; responding, for example, to a cat purring sound picked up by a miniature version of FIG. 1, for example, and triggering human language sentences such as "I want to be cuddled", "pick me up",

or "keep cuddling me", etc.; and an occasional "meow" triggering "I need attention" or "where is my food", etc.; and a more continuous "meowing" creating phrases such as "I'm not happy", etc. Similarly, video/audio recordings of the "communication" between humans and animals as produced in accordance with the invention, may also be entertaining.

[0027] Equipment components and implementations are extremely well-known, though not heretofore arranged, configured or adapted for the specific purposes of the invention. For such purposes, exemplary suitable such devices include, as illustrations: Motorola AN 1517 semiconductor pressure and movement sensors and signal processing circuitry (see Motorola document AN 1517D, 1995); Motorola AN1326 temperature-compensated semiconductor pressure sensors, microcontroller unit and software for signal conditioning (see Motorola document AN 1326/D., 1993); and Information Storage Devices ISD1100 "Chip Corder" series of single chip voice recorder/playback device with microphone, speaker-amplifier, non-volatile memory cells and high-quality solid-state voice reproduction (see ISD ISD100 "Chip Corder" Series bulletin, April 1998).

[0028] Further modifications will also occur to those skilled in this art and such are considered to fall within the spirit and scope of the invention as defined in the appended claims.

ENGLISH-CLAIMS:
Return to Top of Patent

What is claimed is:

1. A method of improving communication and understanding between humans capable of speaking and listening to audible language words and phrases of human-cognitive intelligent meaning, and animals capable of producing varied signals including gestures and emitted sounds of human-audible detectable frequencies and of frequencies outside the human-audible range and that are associated with varied animal behavioral functions, responses to stimuli and intentions, the method comprising, sensing, monitoring and storing varied animal signals including patterns of gestures and/or sounds, while observing the corresponding simultaneous varied behavioral functions, responses and intentions associated substantially with such signals and patterns; correlating the stored signals including the sound patterns as observed to be associated with the corresponding behavioral functions, responses and intentions, and creating a stored library data base therefrom; recording in audible human language, sets of words and phrases correspondingly descriptive of what a human might generally audibly say or describe if it were the human who was performing the same behavioral functions, responses and intentions; correlating the varied human language recordings with the varied correlated animal sounds and patterns stored in the data base corresponding to those behavioral functions, responses and intentions; associatively storing the correlated recorded sets of human words and phrases, in the data base; and, during subsequent real-time interacting with such animals or studying visual recordings thereof, automatically playing back audibly the correlated recorded set of human words and phrases identifying the animal' s actual performance of the corresponding behavioral function, response and intention.

2. The method of claim 1 wherein the sensing, storing, recording and audible playback are effected on the person of the animal, and positioned thereon, such that the audibly played back human words and phrases appear to come from the animal.

3. The method as claimed in claim 2 and in which the audible playback is adjusted to a level that is discernable over any naturally emitted animal sounds.

4. The method as claimed in claim 2 and in which the behavioral function is accompanied by emitted animal sounds in the audible spectrum and outside such spectrum.

5. The method as claimed in claim 4 and in which the sounds outside such spectrum are monitored by heterodyning the same to the audible spectrum.

6. The method as claimed in claim 2 and in which the behavioral function involves animal gesturing movements or

body language.

7. The method as claimed in claim 2 wherein the animals include dolphins.

8. The method as claimed in claim 3 and in which a further recording is produced for viewer entertainment, documenting the audible human language communication interchange between human and animal.

9. Apparatus for improving communication and understanding between humans capable of speaking and listening to audible language words and phrases of human-cognitive intelligent meaning, and animals capable of producing varied signals including gestures and emitted sounds of human-audibly detectable frequencies and outside the human audible range, and that are associated with varied animal behavioral functions, responses and intentions, said apparatus having, in combination, a microprocessor provided with a storage data base comprising a catalog of said varied animal-produced signals as correlated with corresponding animal behavioral functions, responses and intentions, and a corresponding set of recorded human language sets of words and phrases correspondingly descriptive of what a human might generally say or describe if the human were performing the same behavioral functions, responses and intentions and correlated therewith; and means operable to sense and monitor the interacting with such animals and controlled by said microprocessor for automatically playing back audibly the correlated recorded set of human words and phrases in response to the sensing of the animal' s actual subsequent performance of the correlated behavioral function, response and intention.

10. The apparatus as claimed in claim 9 wherein each of the microprocessor sensing, storing and audible playing back is effected on the person of the animal, and positioned thereon such that the audibly played back human words and phrases appear to come from the animal.

11. The apparatus as claimed in claim 9 and in which means is provided for adjusting the playback level discernibly to be heard above any naturally emitted animal sounds.

12. The apparatus as claimed in claim 10 and in which the behavioral function is accompanied by emitted sounds in the audible spectrum and outside the audible spectrum.

13. The apparatus as claimed in claim 12 and in which the sounds outside such spectrum are monitored by means for heterodyning the same into the audible spectrum.

14. The apparatus as claimed in claim 2 and in which a video/audio recording is produced for viewer entertainment, documenting the audible human language communication interchange between human and animal.

15. The apparatus as claimed in claim 9 and in which the behavioral function involves animal gesturing movements or body-language.

16. A method of enabling improved communication and understanding between humans capable of speaking and listening to audible language words and phrases of human-cognitive intelligent meaning, and impaired humans defective at least in such speaking capability, but capable of providing varied signals including gestures and/or emitted sounds that are associated with varied behavioral functions, responses and intentions, said method comprising, sensing, monitoring and storing the varied impaired-human signals, including patterns of gestures and/or sounds, while observing the corresponding simultaneous varied behavioral functions, responses and intentions associated substantially with such signals and patterns; correlating the stored signals including the gesture and or/sound patterns as monitored to be associated with the corresponding behavioral functions, responses and intentions, and creating a stored library data base therefrom; recording in audible human language, sets of words and phrases correspondingly descriptive of what a normal human might generally audibly say or describe if it were the normal human who was performing the same behavioral functions, responses and intentions as performed by the impaired human; correlating the varied language recordings with the varied correlated gesture and/or sound patterns stored in the data base, and storing the correlated recorded sets of words and phrases in the data base; and, during subsequent interacting with the speech-impaired

human, automatically playing back audibly the correlated recorded set of words and phrases identifying the actual performance of the corresponding behavioral function, response or intention of the impaired human.

17. The method of claim 16 wherein each of the sensing, storing, recording and audible playback are effected on the person of the impaired human, and positioned thereon such that the audibly played-back human words and phrases appear to come from the impaired human.

18. A method of improving research and/or communication interaction between humans and animals, such as dolphins and the like, or between normal humans and at least speech-impaired humans, that comprises, playing back audible pre-recorded human-language phrases corresponding to and descriptive of the meaning of sounds and/or gestures or responses produced by the animal or the speech-impaired human in response to stimuli, conditions or environmental events to which the animal or impaired human is subjected; correlating said pre-recorded phrases to represent what the normal human would say or describe if subjected to such stimuli, conditions or environmental events; and, during actual real-time interacting with the animals or such impaired humans, causing such playing back to appear to emanate from the person of such animal or speech-impaired human, as if actually speaking.

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