CLAIMS

1. A method of deception detection based upon ocular information of a subject, the method comprising the steps of:

providing a standoff device configured to view the subject during an examination, the standoff device not in physical contact with the subject, wherein the standoff device has at least one video camera configured to record a close-up view of at least one eye of the subject, and wherein the standoff device has or is connected to a computing device;

providing a cognitive state model configured to determine a high to a low cognitive load experienced by the subject, the cognitive load measuring the extent to which the subject is drawing on mental resources to formulate their response;

providing an emotional state model configured to determine a high to a low state of arousal experienced by the subject, the state of arousal based upon the subject's nervous system activation;

recording, via the at least one video camera, the ocular information of the at least one eye of the subject;

establishing a baseline state of the ocular information of the at least one eye of the subject before questioning of the subject;

asking a question of the subject and allowing the subject to answer the question;

after asking the question and including the time of the subject answering the question, processing the ocular information to identify changes in ocular signals of the subject;

evaluating, via the computing device, the cognitive state model and the emotional state model based solely on the changes in ocular signals and estimating a probability of the subject being either truthful or deceptive;

determining a binary output of either truthfulness or deceptiveness; and

displaying the binary output to an administrator.

2. The method of deception detection of claim 1, wherein the changes in ocular signals comprise any of the following: eye movement, gaze location X, gaze location Y, saccade rate, saccade peak velocity, saccade average velocity, saccade

amplitude, fixation duration, fixation entropy (spatial), gaze deviation (polar angle), gaze deviation (eccentricity), re-fixation, smooth pursuit, smooth pursuit duration, smooth pursuit average velocity, smooth pursuit amplitude, scan path (gaze trajectory over time), pupil diameter, pupil area, pupil symmetry, velocity (change in pupil diameter), acceleration (change in velocity), jerk (pupil change acceleration), pupillary fluctuation trace, constriction latency, dilation duration, spectral features, iris muscle features, iris muscle group identification, iris muscle fiber contractions, iris sphincter identification, iris dilator identification, iris sphincter symmetry, pupil and iris centration vectors, blink rate, blink duration, blink latency, blink velocity, partial blinks, blink entropy (deviation from periodicity), sclera segmentation, iris segmentation, pupil segmentation, stroma change detection, eyeball area (squinting), deformations of the stroma, iris muscle changes.

3. The method of deception detection of claim 1, wherein the step of estimating the probability of the subject being either truthful or deceptive comprises a plurality of estimates taken over a period of time during the subject's answer, wherein the plurality of estimates are weighted and combined to produce the binary output.

4. The method of deception detection of claim 1, wherein the at least one video camera captures frames at a rate of at least 100 frames per second.

5. The method of deception detection of claim 1, wherein the at least one video camera captures frames at a rate of at least 50 frames per second.

6. The method of deception detection of claim 1, wherein the at least one video camera captures frames at a rate of at least 30 frames per second.

7. The method of deception detection of claim 1, wherein the standoff device includes a second video camera configured to record the entirety of the subject's face.

8. The method of deception detection of claim 1, wherein the computing device is a cloud-based computing device disposed remote from the standoff device.

9. The method of deception detection of claim 1, wherein the computing device is part of the standoff device.

10. The method of deception detection of claim 1, wherein the computing device is separate from the standoff device.

11. The method of deception detection of claim 1, wherein, after asking the question of the subject and allowing the subject to answer the question, waiting a period of time and re-establishing the baseline state of the ocular information of the at least one eye of the subject before an additional question is asked of the subject.

12. The method of deception detection of claim 1, wherein an entire statement by the subject is evaluated as the answer to question.

13. The method of deception detection of claim 1, including the step of saving each binary output and each corresponding video recorded by the at least one video camera by the computing device.

14. A method of deception detection based upon ocular information of a subject, the method comprising the steps of:

providing a standoff device configured to view the subject during an examination, the standoff device not in physical contact with the subject, wherein the standoff device has at least one video camera configured to record a close-up view of at least one eye of the subject, and wherein the standoff device has or is connected to a computing device;

providing a cognitive state model configured to determine a high to a low cognitive load experienced by the subject, the cognitive load measuring the extent to which the subject is drawing on mental resources to formulate their response;

providing an emotional state model configured to determine a high to a low state of arousal experienced by the subject, the state of arousal based upon the subject’s nervous system activation;

recording, via the at least one video camera, the ocular information of the at least one eye of the subject;

establishing a baseline state of the ocular information of the at least one eye of the subject before questioning of the subject;

asking a question of the subject and allowing the subject to answer the question;

after asking the question and including the time of the subject answering the question, processing the ocular information to identify changes in ocular signals of the subject;

evaluating, via the computing device, the cognitive state model and the emotional state model based solely on the changes in ocular signals and estimating a probability of the subject being either truthful or deceptive;

determining a binary output of either truthfulness or deceptiveness; and

displaying the binary output to an administrator;

wherein the step of estimating the probability of the subject being either truthful or deceptive comprises a plurality of estimates taken over a period of time during the subject's answer, wherein the plurality of estimates are weighted and combined to produce the binary output.

15. A method of deception detection based upon ocular information of a subject, the method comprising the steps of:

providing a standoff device configured to view the subject during an examination, the standoff device not in physical contact with the subject, wherein the standoff device has at least one video camera configured to record a close-up view of at least one eye of the subject, and wherein the standoff device has or is connected to a computing device;

providing a cognitive state model configured to determine a high to a low cognitive load experienced by the subject, the cognitive load measuring the extent to which the subject is drawing on mental resources to formulate their response;

providing an emotional state model configured to determine a high to a low state of arousal experienced by the subject, the state of arousal based upon the subject's nervous system activation;

recording, via the at least one video camera, the ocular information of the at least one eye of the subject;

establishing a baseline state of the ocular information of the at least one eye of the subject before questioning of the subject;

asking a question of the subject and allowing the subject to answer the question;

after asking the question and including the time of the subject answering the question, processing the ocular information to identify changes in ocular signals of the subject;

evaluating, via the computing device, the cognitive state model and the emotional state model based solely on the changes in ocular signals and estimating a probability of the subject being either truthful or deceptive;

determining a binary output of either truthfulness or deceptiveness; displaying the binary output to an administrator; and

saving each binary output and each corresponding video recorded by the at least one video camera by the computing device.