CLAIMS

1. A powered ophthalmic lens, the powered ophthalmic lens comprising:

a contact lens; and

an eyelid position sensor system at least partially encapsulated in the contact lens, said eyelid position sensor system configured to detect vertical eyelid position and a signal conditioner configured to sample each individual sensor in said sensor system to detect eyelid position and provide an output lid signal;

an eye movement sensor system at least partially encapsulated in the contact lens, said eye movement sensor system including at least one movement sensor to track and determine eye position and a signal conditioner cooperatively associated with said movement sensor and configured to track and determine eye position in spatial coordinates based on information from the output of said movement sensor and provide an output movement signal;

a system controller in electrical communication with said eyelid position sensor system and said eye movement sensor system, said system controller having an associated memory containing a plurality of problem templates and at least two sets of registers for storing data received from said eyelid position sensor system and said eye movement sensor system, said system controller configured to compare the received output lid signal data and the output movement signal data to said plurality of problem templates and produce a control signal when at least one problem template is satisfied;

at least one alert mechanism in electrical communication with said system controller, said alert mechanism configured to receive the output control signal and capable of at least one of providing an alert and storing data; and

wherein when said system controller detects a change in pupil size not in response to a change in environmental light condition as detected by said eyelid position sensor system and where the pupil size is based on at least one signal from said eye movement sensor system, said system controller sends the control signal to said alert mechanism.

2. The powered ophthalmic lens according to Claim 1, wherein at least one of the plurality of problem templates is based on historical data for an intended wearer of said lens.

3. The powered ophthalmic lens according to Claim 1, further comprising:

a user input in electrical communication with said system controller; and

a storage memory in electrical communication with said system controller, and

wherein said system controller includes a buffer memory for storing a plurality of signals from said eyelid position sensor system and said eye movement sensor system such that upon receipt of a signal from said user input, the system controller copies the data in the buffer memory into said storage memory.

4. The powered ophthalmic lens according to Claim 3, wherein said user input includes a receiver capable of receiving wireless input originating with an individual to store the data present in said buffer memory.

5. The powered ophthalmic lens according to Claim 3, further comprising:

a receiver in electrical communication with said system controller, said receiver configured to receive a data request from an external device; and

a transmitter in electrical communication with said system controller and said storage memory, and

wherein said system controller in response to a received data request, transmits the contents of said storage memory through said transmitter to the external device.

6. The powered ophthalmic lens according to Claim 3, wherein when said system controller determines an oscillating signal from said eye movement sensor system, said system controller copies the data in the buffer memory into a storage memory.

7. The powered ophthalmic lens according to Claim 1, wherein said eye movement sensor system includes at least one of at least one photodetector positioned to capture an image of the eye; at least one iris-facing camera configured to detect changes in images, patterns, or contrast to track eye movement; at least one accelerometer to track movement of at least one of

the eye or the contact lens; and at least one neuromuscular sensor configured to detect neuromuscular activity associated with eye movement.

8. The powered ophthalmic lens according to Claim 1, wherein the eye movement sensor system further comprises a signal processor configured to receive signals from said movement sensor, perform digital signal processing, and output one or more to the system controller.

9. A lens pair comprising:

the powered ophthalmic lens according to Claim 1, wherein the eye movement sensor system further comprises a communication system for communication with at least a second contact lens,

said second contact lens having

an eye movement sensor system incorporated into the contact lens, the eye movement sensor system including at least one sensor to track and determine eye position and a signal conditioner cooperatively associated with the sensor and configured to track and determine eye position in spatial coordinates based on information from the sensor output and provide an output movement signal;

a system controller in electrical communication with said eye movement sensor system, and

a communication system for communicating the output of the eye movement sensor system to said first contact lens.

10. The lens pair according to Claim 9, wherein when said system controller in said first contact lens detects divergence of lines of vision of the wearer's eyes, said system controller sends the control signal to said alert mechanism.

11. The lens pair according to Claim 9, wherein each lens further includes a rear-facing pupil diameter sensor in electrical communication with said system controller, said rear-facing pupil diameter sensor for measuring pupil diameter;

said system controller of said second lens is configured to transmit said pupil diameter measurement via said communication systems to said system controller of said first lens such that said first lens system controller is configured to determine whether the measured pupil dilations of the wearer's eye are substantially similar, when the pupil dilations are different, the first system controller configured to send the output control signal to said alert mechanism.

12. The powered ophthalmic lens according to Claim 1, wherein when said system controller detects a stable accelerometer reading in a direction indicative that a wearer is in a prone position after a rapid acceleration in that direction where the readings are from said eye movement sensor system, said system controller sends the control signal to said alert mechanism.

13. The powered ophthalmic lens according to Claim 1, wherein the spatial coordinates are in three dimensions.

14. The powered ophthalmic lens according to Claim 1, wherein

said movement sensor includes at least one accelerometer; and

said system controller compares each signal from said at least one accelerometer against a threshold, when any signal exceeds the threshold, said system controller sends the control signal to said alert mechanism.

15. The powered ophthalmic lens according to Claim 1, further comprising:

an iris-facing light source is in electrical communication with said system controller; and

at least one iris-facing photosensor arranged to receive reflected light back from the eye where said light originates from said light source, said at least photosensor is in electrical communication with said system controller;

a transmitter in electrical communication with said system controller, and

wherein said system controller is configured to send an oximeter signal to said light source and receive a signal from said at least one photosensor, which received signal is transmitted to an external device for processing by said system controller through said transmitter.

16. The powered ophthalmic lens according to Claim 1, wherein said system controller is configured to use more than one system sensor to confirm any determination by said system controller of a need for the output control signal to be sent to said alert mechanism.