CLAIMS

~~What is claimed is:~~

~~1)~~ 1. An apparatus comprising:

an optical system configured with:

a plurality of camera sensors, wherein the plurality of camera sensors includes at least one camera sensor pair comprising a first camera sensor and a second camera sensor, wherein the first and second camera sensors have at least partially overlapping fields of view, wherein the first camera sensor has a first dynamic range, and wherein the second camera sensor has a second dynamic range that is different than the first dynamic range~~each camera sensor creates respective image data of a respective field of view of the respective camera sensor~~;

a plurality of image processing units coupled to the plurality of camera sensors, wherein the image processing units are configured to compress the image data captured by the camera sensors so as to produce compressed image data, ~~and~~ wherein the image processing units are located ~~within an electrical distance of 6 inches of~~proximate to the camera sensors; and

a computing system configured with:

a memory configured to store the compressed image data;

a vehicle-control processor configured to control a vehicle based on the compressed image data,

a data bus configured to communicate the compressed image data between the optical system and the computing system.

~~2)~~ 2. The apparatus of claim 1, wherein the data bus has a bandwidth that is greater than or equal to a bandwidth of the compressed image data, and wherein the data bus bandwidth is less than ~~an~~a bandwidth for the transmission of unprocessed image data.

~~3)~~ 3. The apparatus of claim ~~2~~1, wherein the plurality of camera sensors includes eight camera sensors pairs~~arranged in eight sensor pairs~~, wherein the eight camera sensor pairs are arranged in a circular ring.

~~4)~~ 4. The apparatus of claim 3, wherein the circular ring is configured to rotate.

~~5) The apparatus of claim 2, wherein each camera sensor of the sensor pair is coupled to a different image processing unit than the other camera sensor of the sensor pair.~~

~~6)~~ 5. The apparatus of claim 1, wherein the plurality of image processing units includes at least a first image processing unit ~~is~~ configured to compress image data captured by the first camera sensor and a second image processing unit configured to compress image data captured by the second camera sensor, and wherein the first and second image processing units are configured to compress the first and second image data in parallel. ~~a plurality of images by maintaining a first set of one or more images in the plurality of images and extracting motion data associated with a second set of one or more images in the plurality of images.~~

6. The apparatus of claim 1, wherein the first dynamic range corresponds to a first range of luminance levels and the second dynamic range corresponds to a second range of

luminance levels, wherein the second range of luminance levels includes luminance levels that are higher than the first range of luminance levels.

7. The apparatus of claim 1, wherein each image processing unit is configured to compress a plurality of images by maintaining a first set of one or more images in the plurality of images and extracting motion data associated with a second set of one or more images in the plurality of images.

~~7)~~ 8. The apparatus of claim 1, wherein the optical system is mounted in a sensor dome of the vehicle.

~~8)~~ 9. The apparatus of claim 1, wherein the optical system is mounted behind a windshield of the vehicle.

~~9)~~ 10. A method comprising:

~~providing~~receiving light ~~to~~at a plurality of camera sensors of an optical system to create image data, wherein the plurality of camera sensors includes at least one camera sensor pair comprising a first camera sensor and a second camera sensor, wherein the first and second camera sensors have at least partially overlapping fields of view, wherein the first camera sensor has a first dynamic range, and wherein the second camera sensor has a second dynamic range that is different than the first dynamic range ~~corresponding to a respective field of view for each respective camera sensor~~;

compressing the image data by a plurality of image processing units coupled to the plurality of camera sensors, so as to produce compressed image data, ~~and~~ wherein the image

processing units are located ~~within an electrical distance of 6 inches of~~proximate to the camera sensors;

communicating the compressed image data from the plurality of image processing units to a computing system;

storing the compressed image data in a memory of the computing system; and

controlling a vehicle based on the compressed image data, by a vehicle-control processor of the computing system.

~~10)~~ 11. The method of claim ~~9~~10, wherein the plurality of image processing units includes at least a first image processing unit that compresses image data captured by the first camera sensor and a second image processing unit that compresses image data captured by the second camera sensor, and wherein the first and second image processing units are configured to compress the first and second image data in parallel. ~~further comprising capturing two images by a sensor pair comprising two camera sensors.~~

~~11)~~ 12. The method of claim 10, wherein the first dynamic range corresponds to a first range of luminance levels and the second dynamic range corresponds to a second range of luminance levels, wherein the second range of luminance levels includes luminance levels that are higher than the first range of luminance levels.~~the images captured by each respective camera of the sensor pair are communicated to different image processing units, wherein compressing the image data by a plurality of image processing units comprises a different respective image processing unit compressing the image data from each camera sensor of the sensor pair.~~

~~12) The method of claim 11, wherein the different image processing units are configured to process images received from the sensor pair simultaneously or near simultaneously.~~

~~13)~~ 13. The method of claim ~~8~~10, wherein compressing the image data comprises each image processing unit compressing a plurality of images by maintaining a first set of one or more images ~~maintaining a first set of one or more images~~ in the plurality of images and extracting motion data associated with a second set of one or more images in the plurality of images.

~~14)~~ 14. The method of claim ~~8~~10, wherein compressing the image data comprises storing a first image as a reference image and storing data related to changes with respect to the reference image for subsequent images, and storing a new reference image after a threshold is met.

~~15)~~ 15. A vehicle comprising:

a roof-mounted sensor unit comprising:

an ~~first~~ optical system configured with a first plurality of camera sensors and a plurality of image processing units coupled to the plurality of camera sensors,

wherein ~~each camera sensor of~~ the ~~first~~ plurality of camera sensors at least one camera sensor pair comprising a first camera sensor and a second camera sensor, wherein the first and second camera sensors have at least partially overlapping fields of view, wherein the first camera sensor has a first dynamic range, and wherein the second camera sensor has a second dynamic range that is different than the first

dynamic range~~creates respective image data of a respective field of view of the respective camera sensor~~, and

~~a plurality of first image processing units coupled to the first plurality of camera sensors,~~ wherein the ~~first~~ image processing units are configured to compress the image data captured by the ~~first plurality of~~ camera sensors so as to produce compressed image data, wherein the image processing units are located proximate to the camera sensors;~~,~~

~~a second camera unit comprising:~~

~~a second optical system configured with a second plurality of camera sensors, wherein each camera sensor of the second plurality of camera sensors creates respective image data of a respective field of view of the respective camera sensor,~~

~~a plurality of second image processing units coupled to the second plurality of camera sensors, wherein the second image processing units are configured to compress the image data captured by the second plurality of camera sensors,~~

a computing system located in the vehicle outside of the roof-mounted sensor unit, the computing system comprising:

a memory configured to store the compressed image data; and

a control system configured to control the vehicle based on the compressed image data; and

a data bus configured to communicate the compressed image data between the roof-mounted sensor unit~~, the second camera unit,~~ and the computing system.

~~16)~~ 16. The vehicle of claim 15, wherein the ~~first~~ plurality of camera sensors includes eight camera sensors ~~arranged in eight sensor pairs~~, wherein the eight camera sensor pairs are arranged in a circular ring.

~~17)~~ 17. The vehicle of claim 16, wherein the circular ring is configured to rotate.

~~18)~~ 18. The vehicle of claim ~~16~~15, wherein the plurality of image processing units includes at least a first image processing unit configured to compress image data captured by the first camera sensor and a second image processing unit configured to compress image data captured by the second camera sensor, and wherein the first and second image processing units are configured to compress the first and second image data in parallel. ~~each sensor pair includes a first camera sensor configure to image a scene with a first dynamic range corresponding to a first range of luminance levels and a second camera sensor configured to image the scene with a second dynamic range corresponding to a second range of luminance levels, wherein the second range of luminance levels includes luminance levels that are higher than the first range of luminance levels.~~

~~19)~~ 19. The vehicle of claim ~~16~~15, wherein the first dynamic range corresponds to a first range of luminance levels and the second dynamic range corresponds to a second range of luminance levels, wherein the second range of luminance levels includes luminance levels that are higher than the first range of luminance levels.~~each camera sensor of the sensor pair is coupled to a different image processing unit than the other camera sensor of the sensor pair.~~

~~20)~~ 20. The vehicle of claim 15, wherein ~~the~~each image processing unit~~s are~~is configured to compress a plurality of images by maintaining a first set of one or more

images in the plurality of images and extracting motion data associated with a second set of one or more images in the plurality of images.