Quantification Of Plant Chlorophyll Content Using Google Glass

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INVENTORS

- Ozcan, Aydogan

OTHER INFORMATION

KEYWORDS

Plant chlorophyll, plants, chlorophyll, Google Glass, climate change, water pollution, soil pollution, air quality, urban planting, agriculture

CATEGORIZED AS

- **Optics and Photonics**
  - All Optics and Photonics
- **Environment**
  - Other
  - Sensing
- **Engineering**
  - Engineering
  - Other
- **Imaging**
  - Other
  - Software
- **Sensors & Instrumentation**
  - Biosensors
  - Environmental Sensors
  - Other

RELATED CASES

2015-469-0

SUMMARY

UCLA researchers in the Department of Electrical Engineering have invented a novel device that can quantify chlorophyll concentration in plants using a custom-designed Google Glass app.

BACKGROUND

Large-scale industrialization over the past century has led to a range of environmental impacts in air quality, soil and water pollution, deforestation, and desertification, resulting in both urban and rural public health safety concerns and alarm over human-driven climate change. Plant health and growth rates can be used as an indicator for many environmental factors, where plant chlorophyll concentrations can be used as an important metric. However, methods that directly measure chlorophyll use chemical extraction, which is destructive, complex, time-consuming, and requires trained personnel. Likewise, technologies that can indirectly measure chlorophyll are either based on macroscale analysis or can only analyze small areas, requiring multiple measurements across a leaf's surface.

INNOVATION

Researchers led by Professor Aydogan Ozcan have developed a novel custom-designed Google Glass app with a 3D-printed hand-held portable leaf holder and illuminator device that can rapidly, accurately, and non-destructively estimate chlorophyll levels in various plant species over a wide range of chlorophyll concentrations. This Google Glass based platform can assess plant health under different lighting conditions, providing an excellent alternative to existing methods that are more complex, expensive, or time consuming. This innovative invention will be useful for urban plant monitoring, measuring the effects of climate change, as well as for early detection of water, soil, and air quality degradation.

APPLICATIONS

- Google Glass app
- Monitoring chlorophyll levels in plants
- Studying/monitoring climate change or pollution in water, soil, and air
- Urban plant monitoring
- Environmental and agriculture applications

ADVANTAGES

- Uses Google Glass technology
- Non-destructive, inexpensive, and fast
- Tested and estimated chlorophyll levels in 15 different plant species
- Measures chlorophyll concentration in both outdoor and indoor settings

STATE OF DEVELOPMENT

Prototype devices have been developed and extensively tested, where chlorophyll indices of fifteen different plant species were accurately and blindly estimated under both indoor and outdoor lighting environments.

RELATED MATERIALS

- B. Cortazar, H. C. Koydemir, D. Tseng, S. Feng, and A. Ozcan. Quantification of Plant Chlorophyll Content Using Google Glass. Lab on a Chip. 2014.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,175,215	01/08/2019	2015-469

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Automated Semen Analysis Using Holographic Imaging
- Extended Depth-Of-Field In Holographic Image Reconstruction Using Deep Learning-Based Auto-Focusing And Phase-Recovery

- Detection and Spatial Mapping of Mercury Contamination in Water Samples Using a Smart-Phone
- Computational Cytometer Based On Magnetically-Modulated Coherent Imaging And Deep Learning
- Lensfree Tomographic Imaging
- Single Molecule Imaging and Sizing of DNA on a Cell Phone
- Cross-Modality Deep Learning Brings Bright-Field Microscopy Contrast To Holography
- Microscopic Color Imaging And Calibration
- Rapid, Portable And Cost-Effective Yeast Cell Viability And Concentration Analysis Using Lensfree On-Chip Microscopy And Machine Learning
- Holographic Opto-Fluidic Microscopy
- Design Of Task-Specific Optical Systems Using Broadband Diffractive Neural Networks
- Ultra-Large Field-of-View Fluorescent Imaging Using a Flatbed Scanner
- Revolutionizing Micro-Array Technologies: A Microscopy Method and System Incorporating Nanofeatures
- Tunable Vapor-Condensed Nano-Lenses

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