所属：有明工業高等専門学校　創造工学科

研究タイトル：

光応用計測制御技術について

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職名：	教授	学位：	理学博士（物理学）
所属学会・協会：	電子情報通信学会、応用物理学会、レーザー学会、日工教、九工教		

キーワード：	信号処理、計測制御、光センシング、レーザー応用計測、表面プラズモンセンサー、画像処理
技術相談 提供可能技術：	・ディジタル信号処理、画像データ処理 ・光計測制御技術 ・固体レーザー、色素レーザー、炭酸ガスレーザー、レーザー半導体に関すること ・誘電材料空間電荷計測、レーザー誘導雷技術、惑星大気成分計測

研究内容：

講義科目：ディジタルデータ処理、電磁気学、光応用工学、電子工学実験、電子回路、数値計算、電子回路設計、プログラミング、基礎設計特別演習、合同設計特別演習など（過去の講義科目を含む）

〇研究テーマ：微量気体成分のポータブル遠隔センサ
高感度表面プラズモン共鳴装置の開発
野菜果物の画像イメージングセンサ

〇これまでの共同研究テーマ
「大気微量成分のポータブルセンサの開発」
「微生物コロニーの非接触計測」

〇主な論文

Development of DAIL for CO_2 and CH_4 in the Atmosphere, SPIE's Third International Asia-Pacific Environmental Remote Sensing Symposium, vol 4893, pp141-149, 2002, M. Uchiumi, V. Nilesh, Yokoyama, M. Maeda, O. Uchino

他

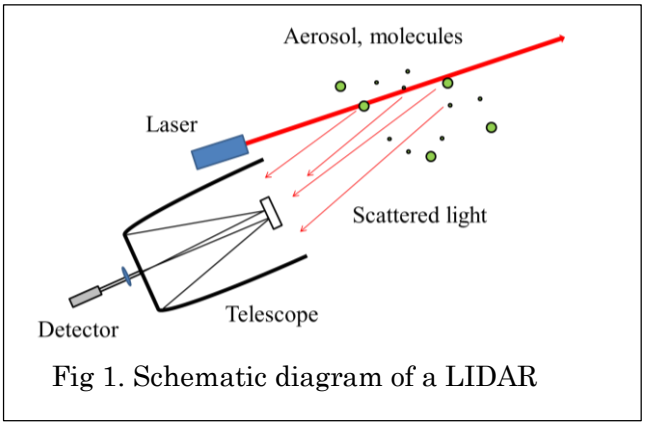

Fig 1. Schematic diagram of a LIDAR

提供可能な設備・機器：

名称・型番（メーカー）	
Nd:YAG レーザー　surelite I-10 （Continuum）	
レーザー励起色素レーザーQuanta-Ray PDL-3 (Spectra Physics)	
Lock-in Amplifier NF6500 (NF 回路設計ブロック)	

Laser Sensing and Processing

Name	Michihiro UCHIUMI	E-mail	uchiumi@ariake-nct.ac.jp
Status	Professor		
Affiliations	Information System Course, Division of Human and Welfare Engineering, Department of Creative Engineering, National Institute ofTechnology, Ariake College		

Keywords	Laser application for measurement, Remote Sensing and Control, Data Processing
Technical Support Skills	· Digital Signal Processing for measurement and control · Laser technology · Space charge in dielectrics, laser-induced lightning, minor constituents in the air

Research Contents

Recently, I have a lot of interest in the laser application to the atmosphere, plant activity and Surface Plasmon Resonance Sensor. For example, I have been developing LIDARs to measure the atmospheric water vapor and carbon dioxide which have strong warming effect to the earth and whose densities in the atmosphere are to be globally measured for the accurate prediction of the future temperature of the earth. The laser-diode with a tuning element is tunable to the atmospheric molecule's absorption lines. The atmospheric water vapor has a tremendous number of absorption lines, we can relatively easily choose the line to be used for the measurement. We have chosen a line at 825 nm because cheap LDs are supplied in this range of wavelength and the cheap detectors are available. My concern is to tune a laser to a line of interest. Having faced a problem that it is difficult to maintain the laser wavelength to the absorption line during the observation, we are developing a wavelength lock system using an absorption cell and a lock-in amplifier.

Lectures

- Digital Signal Processing, Electromagnetics
- Opt-electronics, Electronic circuits, Fundamentals of Optical Information Processing

Present Researches

- Development of a Differential Absorption LIDAR for measurement of H_2O and CO_2
- Development of a Random-Modulated Continuous Wave laser radar
- Development of a Surface Plasmon Sensor
- Development of an Imaging LIDAR for plant

Past Researches

- Differential Absorption LIDAR
- Measurement of Space Charge Distribution in dielectrics
- Laser-Induced Lightning
- Alexandrite LIDAR for the water vapor measurement
- Solar-Blind Lidar for Ozone layer in the atmosphere
- Sodium layer in the mesosphere
- Dye, excimer, alexandrite and Ti: Sapphire laser
- Selective Laser Induced Photodetector

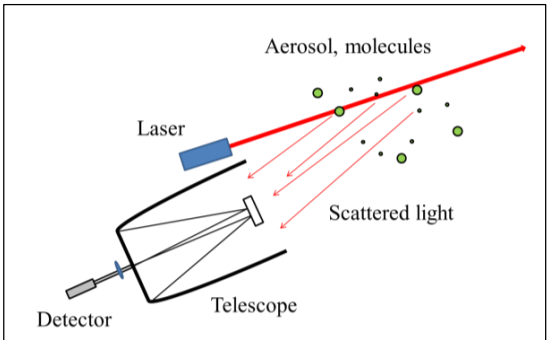

Fig. 1 Schematic diagram of a LIDAR

Available Facilities and Equipment

Nd: YAG Laser; Powerlite, Surelite I-10 (Continuum)	Wavemeter
Dye laser; Quanta-Ray PDL-3 (Spectra Physics)	External Cavity Laser Diode and Tapered Amplifier
Lock-in Amplifier NF6500 (NF Corporation)	DFB lasers and Fiber laser
Nd:YAG Laser-pumped OPO laser Panther (Continuum)	Ti: sapphire laser Carat
DPSS laser Finesse @532nm 4W (Laser Quantum)	