CHARACTERISTICS OF GAAS BASED TYPE-II ALASSB/INGAAS/GAASSB NANOSCALE HETEROSTRUCTURE FOR NEAR INFRARED APPLICATIONS

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ABSTRACT

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Impact of quantum dot parameters on the performance of p-type quantum dot infrared photodetectors

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Highlights

- Infrared photodiode based on the intervalence band absorption has been studied.
- Strain dependent multiband effective mass k.p model is used to compute the electronic structure of QDs.
- Higher CdSe content and larger quantum dot yields better optoelectronic performance.

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ORIGINAL ARTICLE

A framework for index point detection using effective title extraction from video thumbnails

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Abstract For content based indexing of videos, numerous tools and techniques are pipe-lined. The major challenge that these techniques face is the accuracy of index points generated. This paper presents an efficient way to extract text from video frames along with its timestamps. Text extraction takes place in a three-step method which combines pre-processing of extracted Video Frames, similarity measurement for removing ambiguous frames and finally text extraction using PyTesseract Optical Character Recognition. The educational videos with presentations are prioritised. Text extraction is applied upon the headings of that presentation. These extracted keywords are referred to as Index Points through out the article.

Keywords Image processing · OpenCV · Frame retrieval · General framework · Optical character recognition · PyTesseract · Video text extraction · Video frame

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1 Introduction

1.1 Overview

A content-based video analysis is required for effective indexing and retrieval of video. The aim has always been to extract and analyse the text in order to provide an effective and subject-wise breakdown of a video. Text detection and recognition in images and videos is a research field that aims to create a computer system that can interpret the embedded text automatically from images and videos. It can be useful in diverse fields of text collection, site indexing, content-based image indexing and video image extraction, predictive scanning, object recognition etc.

Video frames provide important information in a video explicitly regarding the context and the subject of discussion. If obtained, this knowledge can be used by means of different approaches. The concept behind this article is to extract the keyword from every educational video (specially that contain slides) by cropping the slide headings (a.k.a Index points in this article). These index points would result in proper video indexing and captioning to help the user navigate between the topics in a video file and create a library for better retrieval of information.

1.2 Optical character recognition

Optical character recognition (a.k.a. OCR) deals with an optical system for the identification, interpretation and comprehension of characters. It is a widely used technology which transforms text into digital form .

Post-acquisition, pre-processing, segmented processing, post-level processing, feature extraction are the different stages of OCR (Islam et al. 2017; Ribeiro et al. 2019; Sabu

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An improved Henry gas solubility optimisation-based feature selection approach for histological image taxonomy

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Abstract

Classification of histopathological images is one of the important areas of research in the field of medical imaging. However, the complexities available in histopathological images make the classification process difficult. For such complex images, selection of prominent features for image classification is also a challenging task and is still an open research area for computer vision researchers. Therefore, an effective method for the selection of prominent features of images has been introduced in this work. For the same, an improved Henry gas solubility optimisation has been introduced in which a new position update equation has been used to balance the global and local search. The selected features are then input to classifiers to identify histopathological images. For the performance analysis of improved Henry gas solubility optimisation, 23 benchmark functions are used. The proposed feature selection method has been analysed over two datasets, namely breast cancer cell dataset and ICIAR grand challenge dataset. The proposed feature selection method eliminates the maximum 60% average features from both the datasets. To validate usefulness of selected features, results of different classifiers are compared. Experimental results show that the presented method outperforms other methods.

Keywords: feature selection, Henry gas solubility optimisation algorithm, histology images, image classification

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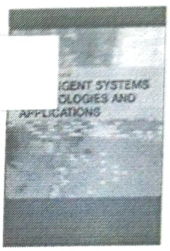

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Design and modeling of InGaAs/GaAsSb nanoscale heterostructure for application of optical fiber communication system

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ABSTRACT

In this paper, we have designed and theoretically analyzed InGaAs/GaAsSb nanoscale heterostructure, where InGaAs is quantum well material and GaAsSb is the barrier material. The proposed design is modeled using the 6 band k.p. method to find the wave functions and optical gain. An optical gain of 6220/cm is obtained at 1550 nm wavelength. The entire structure has been modeled on the GaAs substrate at room temperature 300 K. Due to the low attenuation of silica made optical fiber at 1550 nm wavelength, the designed heterostructure can be used for fiber optics applications.

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1. Introduction

In today's era, optoelectronic or optronics devices such as LEDs, laser diodes, directional couplers and photodetectors are enhancing themselves in fields like telecommunication, biomedical, pollution monitoring tools, etc [1,2]. Optronics devices are designed and fabricated for applications in SWIR (short-wave infrared), MWIR (mid-wave infrared) and NIR (near-infrared). Hence, the choice of material and the bandgap have a prime part in the emission of light for a particular wavelength. The material bandgap adaptation can be possible by the use of compound semiconductors, the use of quantum well structure and the use of strain layer epitaxy [3–5]. The reason to use ternary and quaternary compounds is to form lattice-matched heterostructure. Heterostructure can be formed with the interface and junction that take place between the layers of different bandgap semiconductors. The semiconductors involved in heterostructure have different bandgap energy. Heterojunctions can be formed with precise control on layer thickness using the molecular beam epitaxy and chemical vapour deposition technologies. Now a days, heterostructures based devices are finding its application in designing and fabrication of advanced electronic devices like resonant tunneling devices, optronic devices like optical sources and optical components like waveguides and mirrors.

In semiconductor physics depending on the bandgap, semiconductors are characterized as direct and indirect bandgap. To understand this (E, k) diagram is used. In a direct-bandgap semiconductor, the conduction band to valence band transition of the electron is shortest on the same propagation constant (k). Whereas, in indirect-bandgap semiconductor, the lowest conduction band energy and top of valance band energy lies at different values of k. For the designing and manufacturing of optoelectronic devices, direct-bandgap semiconductors are used due to the favorable recombination of the charge carriers [6]. In Fig. 1, the bandstructure diagram of a general semiconductor is shown. The valence band of a material comprised of three bands heavy-hole band (HHB), light-hole band (LHB) and split-off sub-band (SOB). Here we recognize the sub-bands on the basis of their effective mass. The effective mass of the heavy hole is higher than the light hole sub-band. Also, light hole bands have a larger energy slope compare to heavy hole bands. The split-off band is present far below the conduction band and is of less concern as the energy associated with split off-band is very small and can be neglected.

The main problem with semiconductor lasers is the high effective mass of valence-band. In semiconductors group III-V, this issue is common due to a high imbalance in the effective mass of charge carriers in valance and conduction bands. Recently, it is observed

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