

GRADING AND QUALITY TESTING OF FOOD GRAINS USING NEURAL NETWORK

Nandini Sidnal¹, Uttam V. Patil², Pankaja Patil³

¹Professor, ²Assistant Professor, Computer Science and Engineering KLE Dr MSSCET, Belgaum, Karnataka, India,

³Assistant Professor, Dept of Master of Computer Application, GIT Belgaum, Karnataka, India
sidnal_mandini@gmail.com, mail_uttam@yahoo.com, pankaja_kadlagi@yahoo.co.in

Abstract

The quality of food grains is referred to the every aspect of the profit of supply and marketing. The varieties purity is one of the factors whose inspection is more difficult and more complicated than that of other factors. In the present grain-handling system, grain type and quality are rapidly assessed by visual inspection. This evaluation process is, however, tedious and time consuming. The decision-making capabilities of a grain inspector can be seriously affected by his/her physical condition such as fatigue and eyesight, mental state caused by biases and work pressure, and working conditions such as improper lighting, climate, etc. The farmers are affected by this manual activity. Hence, these tasks require automation and develop imaging systems that can be helpful to identify quality of grain images. A model of quality grade testing and identification is built which is based on appearance features such as the morphological and colour with technology of computer image processing and neural network. The morphological and colour features are presented to the neural network for training purposes. The trained network is then used to identify the unknown grain types, impurities and its quality.

Keywords: Grain quality, image processing, neural network

1. INTRODUCTION

Grains are the prime crop for our country's peasants to increase their agricultural income. The automation level of testing grain quality is low and most work is done by manpower. The workload is so mass that it will lead to workers' fatigue and need them to have ample testing experience. And it also makes the testing more costly and long to be made. With the development of import and export trade this contradiction is more and more outstanding [1]. During grain handling operations, information on grain type and grain quality is required at several stages before the next course of operation can be determined and performed. The varieties purity is one of the factors whose inspection is more difficult and more complicated than that of other factors. In the present grain handling system, grain type and quality are rapidly assessed by visual inspection. This evaluation process is, however, tedious and time consuming. The decision-making capabilities of a grain inspector can be seriously affected by his/her physical condition such as fatigue and eyesight, mental state caused by biases and work pressure, and working conditions such as improper lighting, climate, etc. [2]. The farmers are affected by this manual activity. Hence, these tasks require automation and develop systems that can be helpful to identify grain images, rectify it & then being analysed.

1.1 Problem Definition

In the food industry there are various food stuffs in the form of grains. The food grain types and their quality are rapidly assessed through visual inspection by human inspectors. The decision-making capabilities of human-inspectors are subjected to external influences. A model of quality testing and identification is built which is based on appearance features such as the shape and color with technology of image processing and neural network. The system will take an image of grain and identifies the grains and impurities if any and gives the quality of the grain.

2. DESIGN AND IMPLEMENTATION DETAILS

2.1 System Architecture & Design

The work finds application in grain handling operations as Agriculture Produce Market Committee (APMC), which is an important organization that deals with farmers, produce, measures quality and finally values the produce [3]. Different food grains like wheat, horse gram, corn and rice are considered in the study. Considering example of rice, rice is one of the most important cereal grain crops. The quality of rice has distinct effect on the yield of rice, so the proper inspection of rice quality is very important. During grain handling operations, information on grain type and grain quality is required at several stages before the next course of

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Jin-Ying Zhang



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Advances in Computing and Data Sciences Mayank Singh, P. K. Gupta, Vipin Tyagi, Jan Flusser, Tuncer Ören, Gianluca Valentino, 2020-07-17 This book constitutes the post conference proceedings of the 4th International Conference on Advances in Computing and Data Sciences ICACDS 2020 held in Valletta Malta in April 2020 The 46 full papers were carefully reviewed and selected from 354 submissions The papers are centered around topics like advanced computing data sciences distributed systems organizing principles development frameworks and environments software verification and validation computational complexity and cryptography machine learning theory database theory probabilistic representations The conference was held virtually due to the COVID 19 pandemic

Intelligent Techniques and Applications in Science and Technology Subhojit Dawn, Valentina Emilia Balas, Anna Esposito, Sadhan Gope, 2020-03-02 This book provides innovative ideas on achieving sustainable development and using green technologies to conserve our ecosystem Innovation is the successful exploitation of a new idea Through innovation we can achieve MORE while using LESS Innovations in science technology will not only help mankind as a whole but also contribute to the economic growth of individual countries It is essential that the global problem of environmental degradation be addressed immediately and thus we need to rethink the concept of sustainable development Indeed new environmentally friendly technologies are fundamental to attaining sustainable development The book shares a wealth of innovative green technological ideas on how to preserve and improve the quality of the environment and how to establish a more resource efficient and sustainable society The book provides an interdisciplinary approach to addressing various technical issues and capitalizing on advances in computing optimization for scientific technological development smart information communication bio monitoring smart cities food quality assessment waste management environmental aspects alternative energies sustainable infrastructure development etc In short it offers valuable information and insights for budding engineers researchers upcoming young minds and industry professionals promoting awareness for recent advances in the various fields mentioned above

Proceedings of Fifth International Conference on Soft Computing for Problem Solving Millie Pant, Kusum Deep, Jagdish Chand Bansal, Atulya Nagar, Kedar Nath Das, 2016-04-20 The proceedings of SocProS 2015 will serve as an academic bonanza for scientists and researchers working in the field of Soft Computing This book contains theoretical as well as practical aspects using fuzzy logic neural networks evolutionary algorithms swarm intelligence algorithms etc with many applications under the umbrella of Soft Computing The book will be beneficial for young as well as experienced researchers dealing across complex and intricate real world problems for which finding a solution by traditional methods is a difficult task The different application areas covered in the proceedings are Image Processing Cryptanalysis Industrial Optimization Supply Chain Management Newly Proposed Nature Inspired Algorithms Signal Processing Problems related to Medical and Health Care Networking Optimization Problems etc

Sustainable Communication Networks and Application P. Karuppusamy, Isidoros

Perikos,Fuqian Shi,Tu N. Nguyen,2021-01-25 This book includes novel and state of the art research discussions that articulate and report all research aspects including theoretical and experimental prototypes and applications that incorporate sustainability into emerging applications In recent years sustainability and information and communication technologies ICT are highly intertwined where sustainability resources and its management has attracted various researchers stakeholders and industrialists The energy efficient communication technologies have revolutionized the various smart applications like smart cities healthcare entertainment and business The book discusses and articulates emerging challenges in significantly reducing the energy consumption of communication systems and also explains development of a sustainable and energy efficient mobile and wireless communication network It includes best selected high quality conference papers in different fields such as internet of things cloud computing data mining artificial intelligence machine learning autonomous systems deep learning neural networks renewable energy sources sustainable wireless communication networks QoS network sustainability and many other related areas

Hyperspectral Imaging for Food Quality Analysis and Control Da-Wen Sun,2010-06-29 Based on the integration of computer vision and spectroscopy techniques hyperspectral imaging is a novel technology for obtaining both spatial and spectral information on a product Used for nearly 20 years in the aerospace and military industries more recently hyperspectral imaging has emerged and matured into one of the most powerful and rapidly growing methods of non destructive food quality analysis and control Hyperspectral Imaging for Food Quality Analysis and Control provides the core information about how this proven science can be practically applied for food quality assessment including information on the equipment available and selection of the most appropriate of those instruments Additionally real world food industry based examples are included giving the reader important insights into the actual application of the science in evaluating food products Presentation of principles and instruments provides core understanding of how this science performs as well as guideline on selecting the most appropriate equipment for implementation Includes real world practical application to demonstrate the viability and challenges of working with this technology Provides necessary information for making correct determination on use of hyperspectral imaging

Emerging Non-destructive Technologies for Food Quality Analysis C. K. Sunil,Ashish Rawson,D. V. Chidanand,S. Shanmugasundaram,2025-09-26 Non destructive quality analysis refers to a method of food testing that is designed explicitly to eliminate the potential of damage to the food quality There are various techniques by which this approach may be applied all of which are being used recently for quality analysis which provides important information on food characteristics such as texture structure and mechanical physical and chemical properties Conventional methods of quality analysis are time consuming expensive and invasive in nature particularly for long duration analysis Non destructive methods have thus become highly appealing for their potential to reduce cost and waste and to shorten processing times These approaches not only preserve the integrity of the product but also expedite the analysis process The most common non destructive methods

used include machine vision Spectroscopy E nose tongue Ultrasonics and hyperspectral imaging among others While these methods have been in practice for some time the technological advancements of the last decade have improved the precision and reliability of these tools making them more popular An overview of the dominant non destructive methods including the more novel technologies such as biosensors and terahertz application have not until now been comprehensively covered in the form of a research volume Emerging Non destructive Technologies for Food Quality Analysis brings together detailed information on all these most current advances in technology and elucidates their application in food processing Covering theory principle recent advances and practical applications in food analysis this book will be an invaluable reference for students researchers food trainers and industry personnel Intelligent Computing Kohei Arai,Supriya Kapoor,Rahul Bhatia,2018-11-01 This book gathering the Proceedings of the 2018 Computing Conference offers a remarkable collection of chapters covering a wide range of topics in intelligent systems computing and their real world applications The Conference attracted a total of 568 submissions from pioneering researchers scientists industrial engineers and students from all around the world These submissions underwent a double blind peer review process Of those 568 submissions 192 submissions including 14 poster papers were selected for inclusion in these proceedings Despite computer science s comparatively brief history as a formal academic discipline it has made a number of fundamental contributions to science and society in fact along with electronics it is a founding science of the current epoch of human history the Information Age and a main driver of the Information Revolution The goal of this conference is to provide a platform for researchers to present fundamental contributions and to be a premier venue for academic and industry practitioners to share new ideas and development experiences This book collects state of the art chapters on all aspects of Computer Science from classical to intelligent It covers both the theory and applications of the latest computer technologies and methodologies Providing the state of the art in intelligent methods and techniques for solving real world problems along with a vision of future research the book will be interesting and valuable for a broad readership **Computer Vision Technology for Food Quality Evaluation** Da-Wen Sun,2016-04-07 Computer Vision Technology for Food Quality Evaluation Second Edition continues to be a valuable resource to engineers researchers and technologists in research and development as well as a complete reference to students interested in this rapidly expanding field This new edition highlights the most recent developments in imaging processing and analysis techniques and methodology captures cutting edge developments in computer vision technology and pinpoints future trends in research and development for food quality and safety evaluation and control It is a unique reference that provides a deep understanding of the issues of data acquisition and image analysis and offers techniques to solve problems and further develop efficient methods for food quality assessment Thoroughly explains what computer vision technology is what it can do and how to apply it for food quality evaluation Includes a wide variety of computer vision techniques and applications to evaluate a wide variety of foods Describes the pros and cons of different techniques for quality evaluation

Advanced Computational Methods for Agri-Business Sustainability Satapathy, Suchismita, Muduli, Kamalakanta, 2024-07-10 Globalization has transformed agri food markets creating a single global market with reduced trade barriers. In theory this should bring increased food security yet challenges persist. Small farmers often need help integrating into global sourcing networks and meeting stringent food safety regulations. Additionally there is increasing pressure on businesses and governments to address the environmental and resource consequences of agri food production. Advanced Computational Methods for Agri Business Sustainability offers a comprehensive analysis of agricultural sector challenges and provides practical solutions. It identifies potential issues in agri food management and supply chains, offers mitigation strategies and highlights opportunities for sustainable development. The book aims to bridge the gap between theory and practice, providing insights for academics, policymakers and industry professionals.

Sentimental Analysis and Deep Learning Subarna Shakya, Valentina Emilia Balas, Sinchai Kamolphiwong, Ke-Lin Du, 2021-10-25 This book gathers selected papers presented at the International Conference on Sentimental Analysis and Deep Learning ICSADL 2021 jointly organized by Tribhuvan University Nepal, Prince of Songkla University Thailand and Ejesra during June 18-19, 2021. The volume discusses state-of-the-art research works on incorporating artificial intelligence models like deep learning techniques for intelligent sentiment analysis applications. Emotions and sentiments are emerging as the most important human factors to understand the prominent user-generated semantics and perceptions from the humongous volume of user-generated data. In this scenario, sentiment analysis emerges as a significant breakthrough technology which can automatically analyze the human emotions in the data-driven applications. Sentiment analysis gains the ability to sense the existing voluminous unstructured data and delivers a real-time analysis to efficiently automate the business processes. Meanwhile, deep learning emerges as the revolutionary paradigm with its extensive data-driven representation learning architectures. This book discusses all theoretical aspects of sentimental analysis, deep learning and related topics.

Robotics and Automation in the Food Industry Darwin G Caldwell, 2012-12-03 The implementation of robotics and automation in the food sector offers great potential for improved safety, quality and profitability by optimising process monitoring and control. Robotics and automation in the food industry provides a comprehensive overview of current and emerging technologies and their applications in different industry sectors. Part one introduces key technologies and significant areas of development including automatic process control and robotics in the food industry, sensors for automated quality and safety control and the development of machine vision systems. Optical sensors and online spectroscopy, gripper technologies, wireless sensor networks, WSN and supervisory control and data acquisition (SCADA) systems are discussed with consideration of intelligent quality control systems based on fuzzy logic. Part two goes on to investigate robotics and automation in particular unit operations and industry sectors. The automation of bulk sorting and control of food chilling and freezing is considered, followed by chapters on the use of robotics and automation in the processing and packaging of meat, seafood, fresh produce.

and confectionery Automatic control of batch thermal processing of canned foods is explored before a final discussion on automation for a sustainable food industry With its distinguished editor and international team of expert contributors Robotics and automation in the food industry is an indispensable guide for engineering professionals in the food industry and a key introduction for professionals and academics interested in food production robotics and automation Provides a comprehensive overview of current and emerging robotics and automation technologies and their applications in different industry sectors Chapters in part one cover key technologies and significant areas of development including automatic process control and robotics in the food industry and sensors for automated quality and safety control Part two investigates robotics and automation in particular unit operations and industry sectors including the automation of bulk sorting and the use of robotics and automation in the processing and packaging of meat seafood fresh produce and confectionery

Computational Intelligence in Data Mining - Volume 3 Lakhmi C. Jain,Himansu Sekhar Behera,Jyotsna Kumar Mandal,Durga Prasad Mohapatra,2014-12-11 The contributed volume aims to explicate and address the difficulties and challenges for the seamless integration of two core disciplines of computer science i e computational intelligence and data mining Data Mining aims at the automatic discovery of underlying non trivial knowledge from datasets by applying intelligent analysis techniques The interest in this research area has experienced a considerable growth in the last years due to two key factors a knowledge hidden in organizations databases can be exploited to improve strategic and managerial decision making b the large volume of data managed by organizations makes it impossible to carry out a manual analysis The book addresses different methods and techniques of integration for enhancing the overall goal of data mining The book helps to disseminate the knowledge about some innovative active research directions in the field of data mining machine and computational intelligence along with some current issues and applications of related topics

Headspace Analysis of Foods and Flavors Russell L. Rouseff,Keith R. Cadwallader,2012-12-06 Headspace gas analysis is an analytical technique that has been successfully applied to food flavors for over 20 years but has experienced a resurgence of interest and innovation in recent years In its truest form headspace analysis represents the direct collection and analysis of the mixture of vapors in the space immediately above a food or beverage The technique offers several advantages for workers interested in how a product smells and ultimately tastes It offers the advantages of speed simplicity and more importantly represents the aroma profile a consumer is likely to experience just before consuming the product Since only volatile components are collected the sample is totally free of nonvolatile residues which commonly plague comparison liquid liquid extracts of the same product This is the first book devoted to headspace analysis in foods and beverages in more than 20 years The publication contains chapters on the basic theory of headspace analysis as well as the theory and application of newly developed headspace techniques such as solid phase micro extraction SPME and electronic noses New concentrating and desorption techniques are described in addition to a raft of food applications including tomato and citrus juices alcoholic beverages baguettes dairy products

lipids grill flavoring baked potato and meat Chapters on off flavors as well as aroma food matrix interactions are also included This is the bible of headspace analysis If you are involved in or planning on becoming involved or want to learn more about this incredible subject then buy this book immediately Aubrey Parsons governing council member International Union for Food Science and Technology

Evaluation Technologies for Food Quality Jian Zhong,Xichang Wang,2019-04-16 Evaluation Technologies for Food Quality summarizes food quality evaluation technologies which include sensory evaluation techniques and chemical and physical analysis In particular the book introduces many novel micro and nano evaluation techniques such as atomic force microscopy scanning electron microscopy and other nanomaterial based methods All topics cover basic principles procedures advantages limitations recent technology development and application progress in different types of foods This book is a valuable resource for scientists in the field of food science engineering and professionals in the food industry as well as for undergraduate and postgraduate students studying food quality evaluation technology Explains basic principles procedures advantages limitations and current applications of recent food quality technologies Provides guidance on the understanding and application of food quality evaluation technology in the field of food research and food industry Introduces many novel micro nano evaluation techniques such as atomic force and scanning electron microscopies and other nanomaterial based methods

Novel Food Analysis Tanmay Sarkar,2025-09-30 This book focuses on cutting edge protocols for novel food analysis covering advanced techniques for food safety quality assessment authentication and nutritional profiling It provides step by step methodologies for emerging analytical tools such as CRISPR based detection nano sensors mass spectrometry lab on a chip technology spectroscopic techniques and ultrasonication methods Written in the format of the Methods and Protocols in Food Science series chapters list necessary materials and methods for readily reproducible protocols Authoritative and cutting edge Novel Food Analysis Techniques and Applications aims to be a comprehensive resource for both academic and industrial applications

Food Quality Analysis Ashutosh Kumar Shukla,2022-11-18 Food Quality Analysis Applications of Analytical Methods Coupled With Artificial Intelligence provides different spectroscopic techniques and their application to food quality analysis with the unique approach of adding multivariate analysis as well as artificial intelligence applications It also brings chromatographic methods for the analysis of a wide range of food items including wheat flours oils and fats Written by a team of interdisciplinary experts this is a valuable resource for researchers and personnel involved in food industries Covers food quality analysis experience combined with spectroscopic techniques artificial intelligence and machine learning Presents the applications of analytical techniques to speed up the resolution of food safety issues prevent food fraud and traceability purposes Explores different spectroscopic techniques and their application to food quality analysis

Trends in Wireless Communication and Information Security Mithun Chakraborty,Raman Kr. Jha,Valentina Emilia Balas,Samarendra Nath Sur,Debdatta Kandar,2021-04-22 This book presents best selected papers presented at the International Conference on Emerging Wireless Communication

Technologies and Information Security EWCIS 2020 held from 8th 9th October 2020 at Amity University Jharkhand Ranchi India The book includes papers in the research area of wireless communications and intelligent systems signal and image processing in engineering applications data communication and information security IoT and cloud computing The contribution ranges from scientists engineers and technologists from academia as well as from industry Sensing Technology: Current Status and Future Trends II Alex Mason, Subhas Chandra Mukhopadhyay, Krishanthi Padmarani Jayasundera, Nabarun Bhattacharyya, 2013-12-09 This book is written for academic and industry professionals working in the field of sensing instrumentation and related fields and is positioned to give a snapshot of the current state of the art in sensing technology particularly from the applied perspective The book is intended to give broad overview of the latest developments in addition to discussing the process through which researchers go through in order to develop sensors or related systems which will become more widespread in the future *Animal Nutrition Science* Gordon McL. Dryden, **Cereal Grains** Colin Wrigley, Ian Batey, Diane Miskelly, 2016-12-27 Cereal Grains Assessing and Managing Quality Second Edition provides a timely update to this key reference work Thoroughly revised from the first edition this volume examines the latest research and advances in the field New chapters have been added on alternative grains including ancient grains and pseudocereals biosecurity and industrial processing of grains amongst others Quality and food safety are important throughout the value addition chain from breeding production harvest storage transport processing and marketing At all stages analysis is needed so that quality management can proceed intelligently These considerations are examined for each of the major cereal species including wheat common and durum rye and triticale barley and oats rice maize corn pseudocereal species sorghum and the millets Divided into five sections the book analyses these for the range of cereal species before a final section summarizes key findings Documents the latest research in cereal grains from their nutraceutical and antioxidant traits to novel detection methods Provides a complete and thorough update to the first edition analyzing the range of major cereal species Presents detailed advice on the management of cereal quality at each stage of production and processing

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Table of Contents Classification And Quality Analysis Of Food Grains

1. Understanding the eBook Classification And Quality Analysis Of Food Grains
 - The Rise of Digital Reading Classification And Quality Analysis Of Food Grains
 - Advantages of eBooks Over Traditional Books
2. Identifying Classification And Quality Analysis Of Food Grains
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Classification And Quality Analysis Of Food Grains
 - User-Friendly Interface
4. Exploring eBook Recommendations from Classification And Quality Analysis Of Food Grains
 - Personalized Recommendations
 - Classification And Quality Analysis Of Food Grains User Reviews and Ratings
 - Classification And Quality Analysis Of Food Grains and Bestseller Lists
5. Accessing Classification And Quality Analysis Of Food Grains Free and Paid eBooks
 - Classification And Quality Analysis Of Food Grains Public Domain eBooks
 - Classification And Quality Analysis Of Food Grains eBook Subscription Services
 - Classification And Quality Analysis Of Food Grains Budget-Friendly Options
6. Navigating Classification And Quality Analysis Of Food Grains eBook Formats

- ePub, PDF, MOBI, and More
 - Classification And Quality Analysis Of Food Grains Compatibility with Devices
 - Classification And Quality Analysis Of Food Grains Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Classification And Quality Analysis Of Food Grains
 - Highlighting and Note-Taking Classification And Quality Analysis Of Food Grains
 - Interactive Elements Classification And Quality Analysis Of Food Grains
 8. Staying Engaged with Classification And Quality Analysis Of Food Grains
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Classification And Quality Analysis Of Food Grains
 9. Balancing eBooks and Physical Books Classification And Quality Analysis Of Food Grains
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Classification And Quality Analysis Of Food Grains
 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
 11. Cultivating a Reading Routine Classification And Quality Analysis Of Food Grains
 - Setting Reading Goals Classification And Quality Analysis Of Food Grains
 - Carving Out Dedicated Reading Time
 12. Sourcing Reliable Information of Classification And Quality Analysis Of Food Grains
 - Fact-Checking eBook Content of Classification And Quality Analysis Of Food Grains
 - Distinguishing Credible Sources
 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
 14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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