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MÜHENDİSLİK FAKÜLTESİ

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Kaan ERARSLAN VIRTUAL-AUGMENTED REALITY & GAMIFICATION

PREFACE

Virtual and augmented reality represent a digital transformation in information and human interaction, a technological leap forward in hardware and software. **Gamification**, on the other hand, is the presentation of serious professional topics to the user through a game-like narrative. With this content, the book's topics are relevant and applicable to nearly every profession and academic discipline, including engineering, fine arts, health, science, architecture, social sciences, and educational sciences.

With its hardware and software infrastructure, digital transformation technologies continue to develop both as a standalone field and as a component within the larger technological matrix comprised of artificial intelligence, deep learning, the internet of things, smart systems, and visual communication elements. Virtual and augmented reality headsets add a different technological dimension and new features to current computer and mobile device usage. Gamification, on the other hand, presents a variety of scenarios in technical and social fields, particularly for educators, as educational materials.

This book presents, at a basic knowledge and skill level, how to develop virtual-augmented reality and gamification applications for **everyone**. Within this framework, which appeals to all professional disciplines, **mining applications** have been designated as a special area.

Using the **Unity** *Real-Time Development Engine*, application developers are provided with step-by-step visual support to teach fundamental knowledge and skills in these areas. Various application development approaches, templates, and projects are implemented on devices such as the **Meta Oculus Quest 2/3, HTC Vive**, and **MS Hololens 2**. templates from manufacturers such as **Unity**, **Microsoft**, **Vuforia**, and **Meta** are utilized.

In applications using the **Unity 2022.3 LTS and Unity 6000.0 LTS** series, code was developed using the **Microsoft Visual Studio C#** compiler.

Furthermore, mining scenarios demonstrate how this general knowledge can be translated into concrete professional applications. Studies are included that can be used as digital training support materials for both open pit and quarries, as well as underground mining environments.

This study, designed with a certain knowledge base in mind, recommends that those new to the Unity engine download the **"Introduction to Unity Real-Time Development Engine with Applications for Mining"** and acquire the necessary background:

https://www.seruvenyayinevi.com/Webkontrol/SayfaYonetimi/Dosyalar/Introduction-to-unity-a-realtime-development-engine-with-applications-for-mining_sayfa_g328_LXskPca5.pdf

I wish success to the academicians, researchers and students who want to work on the subjects discussed in the book.

Prof.Dr. Kaan Erarslan
Kütahya Dumlupınar University
Faculty of Engineering
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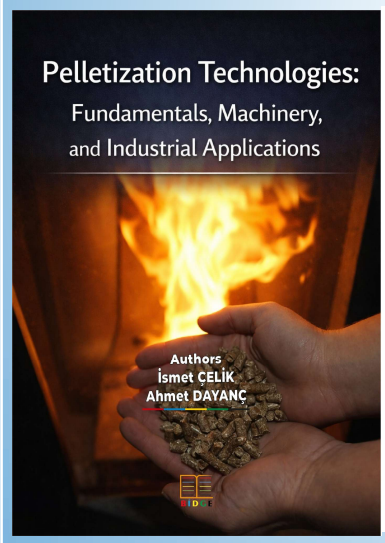

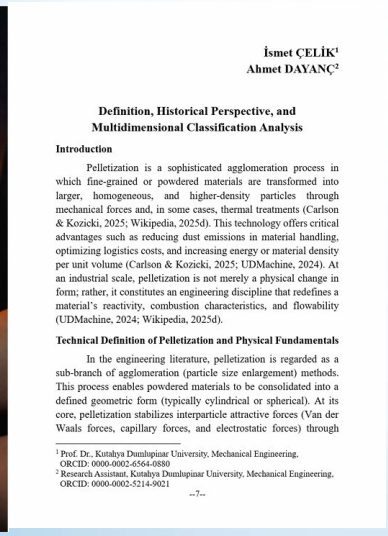

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Definition, Historical Perspective, and Multidimensional Classification Analysis

Introduction

Pelletization is a sophisticated agglomeration process in which fine-grained or powdered materials are transformed into larger, homogeneous, and higher-density particles through mechanical forces and, in some cases, thermal treatments (Carlson & Kozicki, 2025; Wikipedia, 2025d). This technology offers critical advantages such as reducing dust emissions in material handling, optimizing logistics costs, and increasing energy or material density per unit volume (Carlson & Kozicki, 2025; UDMachine, 2024). At an industrial scale, pelletization is not merely a physical change in form; rather, it constitutes an engineering discipline that redefines a material's reactivity, combustion characteristics, and flowability (UDMachine, 2024; Wikipedia, 2025d).

Technical Definition of Pelletization and Physical Fundamentals

In the engineering literature, pelletization is regarded as a sub-branch of agglomeration (particle size enlargement) methods. This process enables powdered materials to be consolidated into a defined geometric form (typically cylindrical or spherical). At its core, pelletization stabilizes interparticle attractive forces (Van der Waals forces, capillary forces, and electrostatic forces) through

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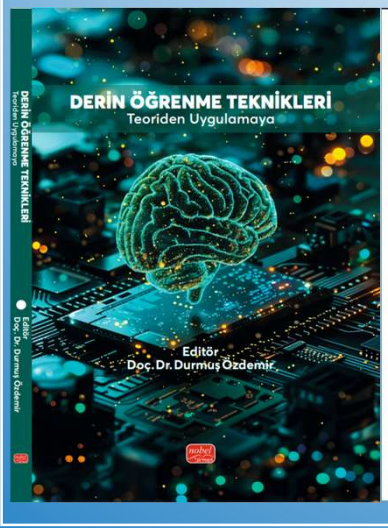

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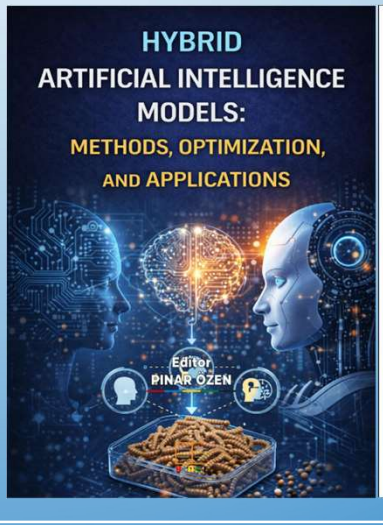

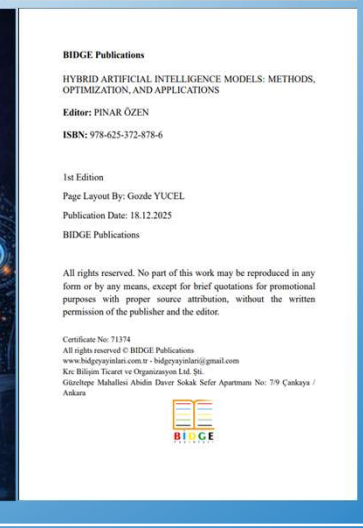

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