

Thesis Project Portfolio

Design and Construction of Modern University of Virginia Themed Pinball Machine

(Technical Report)

Classical Thomistic Just War Theory and its Applicability in the Modern Environment

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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Spring, 2024

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Executive Summary

The potential applications of engineering are as diverse and varied as the limits of the human imagination. They encompass matters both trivial and grave, and this duality is expressed in the technical and sociotechnical projects I undertook as part of my fourth-year capstone project. In my technical project, I participated in an effort to design and fabricate a UVA-themed pinball machine. This project was inspired by an unsuccessful attempt in 2016 and a desire to contribute to the cultural life of the university. Contrastingly, my STS research paper investigates the classical Thomistic Just War Theory, and questions regarding the permissibility of when a nation can resort to war and how war ought to be conducted. I contrasted the classical theory with recent developments to evaluate the relevance of the classical theory in the modern environment and the compatibility of modern innovations with the classical principles. Although these topics bear minimal connection to one another, they illustrate the breadth of the applications of engineering, as well as the varied and multitudinous opportunities afforded by my pursuit of study in the field of mechanical engineering.

The pinball machine project was undertaken to satisfy several goals, including a desire to leave a legacy at UVA following graduation, a desire to design and fabricate a novel product to engage with the engineering process through ideation, design, fabrication, and iteration. We first examined the failed 2016 attempt and classic pinball machines, such as the 1980 Williams Black Knight machine, to provide inspiration for the design of our machine. We then identified various mechanisms to be developed and tested. We then ideated, fabricated, tested, and iterated designs for the various mechanisms which would comprise the pinball machine. At the conclusion of the

project, we had completed designs for more than half of the mechanisms and left the project in a position to be easily continued and completed by a future group.

For the sociotechnical portion of my thesis, I investigated the following research questions. Does the classical theory remain relevant and applicable in the modern environment? Is it sufficient as an evaluative framework? What ideas need to be further developed in light of current situations? The topic is significant on account of the continued presence of armed conflict and the likelihood of a major conflict between the United States and China over Taiwan in the very near future. To answer these questions, several modern innovations and pressing issues were examined from the perspective of classical theory and evaluated accordingly. Competing examples of modern scholarship were contrasted. It was concluded that the newer additions to the theory have merit, but are subordinate in importance to the classical principles.

Although both projects were vastly different from one another, a similar conclusion can be drawn from each. Namely, both projects elucidated the value of tradition and prior principles. As we were designing our pinball playfield and mechanisms, we took inspiration from past designs which played a significant role in shaping the development of our own. The new developments in just war thinking which were sensible and coherent were the ones which were constructed in fidelity to the classical principles. As engineers innovate to shape the future, it would behoove them to thoughtfully reflect on the lessons and time-tested principles of the past for guidance and inspiration and to follow the principle of Chesterton's fence, not overturning an existing norm without fully understanding the reasoning for the norm's establishment.