Final Report

Submitted to the Embedded Systems Competition (ESC) of SBESC 2024

Project Title：

Students:

Professor:

University:

JEMS ID:

Link to video:

Declaration of Originality

We hereby declare that this report and the work reported herein was composed and originated entirely by ourselves. Information derived from the published and unpublished work of others has been acknowledged in the text and a list of citations is given in the references section

Professor's Signature: ______________________________________

Name (in Block Letters):

Student's Signature: ______________________________________

Name (in Block Letters):

Student's Signature: ______________________________________

Name (in Block Letters):

Student's Signature: ______________________________________

Name (in Block Letters):

Date:

Abstract

Sample text format.
HCCI (Homogenous Charge Compression Ignition) combustion has advantages in terms of efficiency and reduced emission. HCCI combustion can not only ensure both the high economic and dynamic quality of the engine, but also efficiently reduce the NOx and smoke emission. Moreover, one of the remarkable characteristics of HCCI combustion is that the ignition and combustion process are controlled by the chemical kinetics, so the HCCI ignition time can vary significantly with the changes of engine configuration parameters and operating conditions. In this work numerical scheme for the ignition and combustion process of DME homogeneous charge compression ignition is studied. The detailed reaction mechanism of DME proposed by American Lawrence Livermore National Laboratory (LLNL) and the HCT chemical kinetics code developed by LLNL are used to investigate the ignition and combustion processes of an HCCI engine fueled with DME. The new kinetic mechanism for DME consists of 79 species and 399 reactions. To consider the effect of wall heat transfer, a wall heat transfer model is added into the HCT code. By this method, the effects of the compression ratio, the fuel-air equivalence ratio, the intake charge heating, the engine speed, EGR and fuel additive on the HCCI ignition and combustion are studied. The results show that the HCCI combustion fueled with DME consists of a low temperature reaction heat release period and a high temperature reaction heat release period. It is also founded that increasing the compression ration, the equivalence ratio, the intake charge temperature and the content of H_2O_2, H_2 or CO cause advanced ignition timing. Increasing the engine speed, adoption of cold EGR and the content of CH_4 or CH_3OH will delay the ignition timing.

Keywords: HCCI, chemical kinetics, numerical simulation, DME, EGR

Content

1. Introduction

Include in this section: Objectives, project rationale, application areas.

Sample text format.

HCCI (Homogenous Charge Compression Ignition) combustion has advantages in terms of efficiency and reduced emission. HCCI combustion can not only ensure both the high economic and dynamic quality of the engine, but also efficiently reduce the NOx and smoke emission. Moreover, one of the remarkable characteristics of HCCI combustion is that the ignition and combustion process are controlled by the chemical kinetics, so the HCCI ignition time can vary significantly with the changes of engine configuration parameters and operating conditions. In this work numerical scheme for the ignition and combustion process of DME homogeneous charge compression ignition is studied.

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2. System Description

2.1 System Description

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See equation template in equation (2-1). In Table 2-1 one can see table template and in Figure 2-1 one can see figure template.

$$m = \sum_{k=1}^{K} m_k \quad (2 - 1)$$

Table 2-1

ITEM	H_F(KCAL/MOL)	S_F(KCAL/MOL)	C_P(KCAL/MOL)
A1	100	100	100
A2	200	200	200
A3	300	300	300
A4	400	400	400
A5	500	500	500
A6	600	600	600
A7	700	700	700
A8	800	800	800

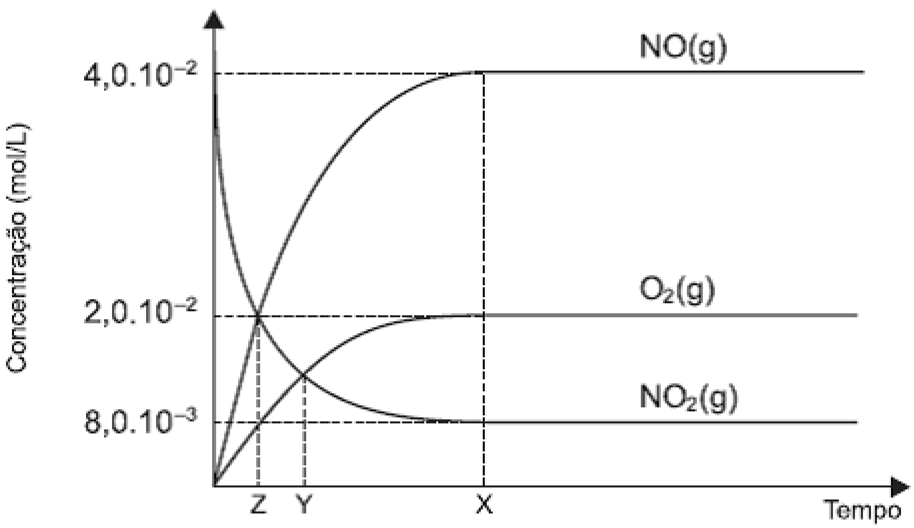

Figure 2-1 Caption

3. System Implementation

Describe implementation here; make sure your description provides sufficient information for the referees to grasp the complexity of your solution.

4. Results

Describe results here...

In this section you should also discuss the validation procedures that were used.

5. Innovation

In this section you should discuss the originality of this work and its innovative aspects.

6. Conclusion

Conclusions here...

References

[1] World Health Organization. Factors regulating the immune response: report of WHO Scientific Group[R]. Geneva:WHO,1970.

[2] CHRISTINE M. Plant physiology: plant biology in the Genome Era[J/OL]. Science, 1998, 281:331-332[1998-0923]. http://www.sciencemag.org/cgi/collection/anatmorp

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The text below is not to be included in this report. It was inserted here for reference:
Please observe the Competition Rules:

1.5.3. Fase Final:

1.5.3.1 Os Grupos aprovados para esta fase terão até o dia **18 de novembro de 2022** para apresentarem o Relatório Final do Projeto, que deverá ser composto dos seguintes documentos / artefatos:

a) Relatório completo: O relatório deve ser em inglês e seguir o modelo que está disponível no Site. O relatório deve conter as seguintes informações: declaração de originalidade, título, resumo (o resumo deverá seguir o modelo anexo e conter até 250 palavras), palavras-chave, diagrama de blocos do sistema, funções e implementação, planos de teste, validação e análise dos resultados, além das referências. O relatório deve conter até 20 páginas (espaçamento simples entre linhas), incluindo todas as informações necessárias. O relatório, em formato pdf, deve ser submetido pelo JEMS.

b) Comprovação de matrícula: documento da Universidade comprovando que os integrantes do Grupo são alunos devidamente matriculados na Universidade. Este documento pode ser uma carta da Universidade assinada pelo diretor da unidade ou as cópias digitais dos comprovantes de matrícula do semestre atual dos Alunos, onde apareça o número do registro acadêmico e o nome completo do Aluno, além das disciplinas cursadas no semestre, com carimbo e assinatura do coordenador do curso ou autenticação digital.

c) No caso de o evento não poder ser presencial, em função de restrições sanitárias, na mesma data (18 de novembro de 2022) deve ser submetido também um Vídeo do Projeto na sua versão final, que servirá como material de convite e divulgação para a Fase Final, devendo também ser preparado de acordo com instruções a serem disponibilizadas no Site.

1.5.3.2. Todos os Grupos participantes da Fase Final deverão se apresentar no Evento SBESC 2022, que será realizado de **21 a 24 de novembro de 2022** em Fortaleza/CE, ou, caso o evento seja não-presencial, em ambiente virtual online, utilizando-se para tanto de plataformas e procedimentos a serem definidos pela organização e disponibilizados no Site. **Os custos de inscrição e deslocamento para o Evento deverão ser arcados diretamente pelo Grupo.**

IMPORTANTE: o SBESC e a ESC acontecerão de forma **presencial**