Project Progress Report

프로젝트 진행 상황 보고서

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Contents

3주차 리뷰

Markdown

Markdown 형식으로 변환 하였지만, 마크 다운으로는 임베딩이 되지만 인식이 안되어 새로운 방안 활용

JSONL

json 포멧팅에 적합한 형태로 텍스트 파일을 규격화

전문과 개정안 병합

UNECE Rel.78, Rel.139, Rel.152 전문과 개정안이 따로 존재.
-> 개정안이 반영된 전문 필요

rag 질문지 평가

gpt를 활용한 질문지 구성에 관해 이상호책임님께 보낼 것, 퍼포먼스와 코스트간의 차이를 찾는것이 중요함

Markdown 전처리

- MarkdownHeadspliter

Markdown Header를 기준으로 텍스트를 분할하여, 분할 된 것을 해당 청크로 인식

: 예시 : “#” -> Title, “##” -> Sub-Title, “###” -> Sub -Content

실행한 방안

“#” -> Title - Addendum 77: UN Regulation No. 78 (문서 제목)

“##” -> Sub-Title - Regulation, Annexe1,2,3 (문서 중 제목)

“###” -> Sub -Content - 1. Scope , 6. Tests (문서 소 제목)

이러한 방식으로 본 문서의 문단 구조를 활용해 청크 나눔

MarkdownHeaderSpliter

- 실험 방법

실험 조건 : 팀에서 사용한 기존 RAG 코드 사용

차이점 : Chunk Overlap = 100, 테이블 데이터 따로 전처리 하지 않음

평가 요소 : 기존에 활용한 RAG 평가 요소 질문지 + 테이블 데이터 인식 여부 + 문단 간 구분 가능 여부

평가 요소 선정 이유 :

- 동일한 질문지를 사용해 기존 모델과 비교 분석을 하기 위해 진행
- 따로 전처리 없이도 해당 언어 모델이 인식 가능한지 확인하기 위해 진행
- MarkdownHeaderSpliter 구분을 언어 모델이 이해하기 쉽게 이해 했는지 확인하기 위해 진행

MarkdownHeaderSpliter

- 실험 결과

1.기존에 활용한 RAG 평가 요소 질문지

: 6개의 질문 중 5개 질문에 정확하게 답변. 그러나 정확성은 기존 모델이 1개 차이로 우수
차이점으로는 , 예를 들어 테스트 절차에 대한 물음에는 개조식 형식으로 각 항목별로 필요한 테스트 조건을 자세히 답변함

2. 테이블 데이터 인식 여부

: 전처리 없이 그냥 텍스트로만 인식을 하였는데, 인식은 하나 다수의 정보를 누락한채 답변함

3. 문단 간 구분 가능 여부

: 6개 중 1개의 답변의 경우 참조한 문서 세부 번호까지 알려주는 답변을 함, 프롬프트에 어디에 참조했는지도 알려달라고 하니 6개 중 5개 이상의 답변을 할 때 참조한 문서 번호를 알려줌

Markdown 전처리

- 향후 방안

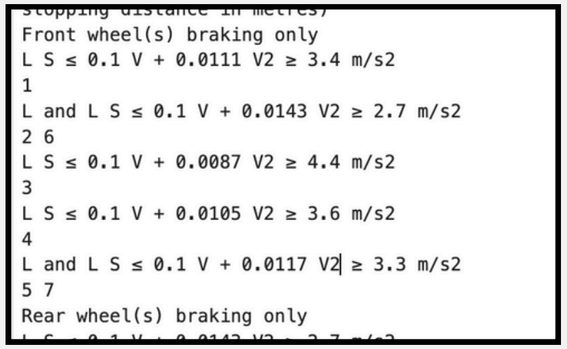
1.헤더 구분 텍스트를 따로 삽입하여 기존 소제목 구분 기호가 없어지지 않도록 유지

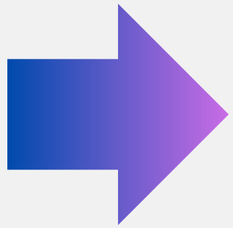
: 본문 텍스트에 “### 6. Scope” 라고 하여 텍스트 분할 할때 소제목 부분이 같이 없어 졌는데, 추후에는 삭제되지 않도록 기존 소제목 유지 및 새로운 “### 6. Scope” 삽입

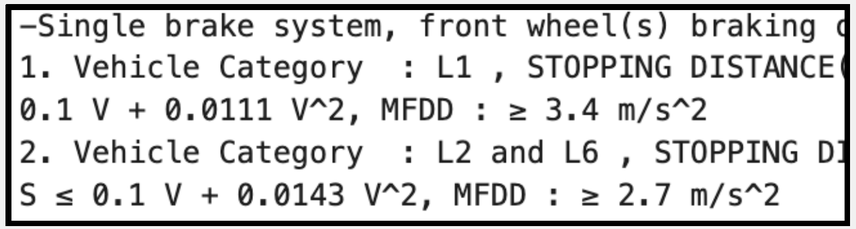
2. 테이블 데이터를 모델이 인식이 가능한 텍스트 데이터로 전처리

- 예를 들어 각 열 이름을 각 행의 값마다 기입

기존 :







JSONL 전처리

1. Scope
This Regulation applies to vehicles of category L.1
These categories do not include: "item"
(a) Vehicles with a Vmax of < 25 km/h;
(b) Vehicles equipped for disabled riders.
2. Definitions
For this Regulation:
2.1. "Antilock Brake System (ABS) " means a system that senses wheel slip and automatically modulates the pressure producing the braking forces at the wheel(s) to limit the degree of wheel slip.
2.2. "Approval of a vehicle " means the approval of a vehicle type with regard to braking.
2.3. "Baseline test " means a stop or a series of stops carried out in order to confirm the performance of the brake prior to subjecting it to a further test such as the heating procedure or wet brake stop.
2.4. "Brake " means those parts of the brake system where the forces opposing the movement of the vehicle are developed.
2.5. "Brake system " means the combination of parts consisting of the control, transmission, and brake, but excluding the engine, whose function is to progressively reduce the speed of a moving vehicle, bring it to a halt, and keep it stationary when halted.
2.6. "Combined brake system (CBS) " means: "item"
(a) For vehicle categories L 1 and L 3: a service brake system where at least two brakes on different wheels are operated by the actuation of a single control.
(b) For vehicle categories L 2, L 5, L 6, and L 7: a service brake system where the brakes on all wheels are operated by the actuation of a single control.
(c) For vehicle category L 4: a service brake system where the brakes on at least the front and rear wheels are operated by the actuation of a single control. (If the rear wheel and sidecar wheel are braked by the same brake system, this is regarded as the rear brake.)
2.7. "Components of the braking system " means one of the individual parts which, when assembled, constitute the braking system.
2.8. "Control " means the part actuated directly by the rider in order to supply or control the energy required for braking the vehicle to the transmission.
2.9. "Different types of braking systems " means devices that differ in such essential respects as: "item"

Jsonl 포맷팅을 위해서는 텍스트 데이터를 최대한 규격화 하는 과정을 진행

JSONL 전처리

{'Resource': 'Addendum 77: UN Regulation No. 78',
 'Title': 'Agreement: Concerning the Adoption of Harmonized Technical United Nations Regulations for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these United Nations Regulations',
 'Version': 'Revision 3',
 'chapter 1': {'Chapter': '1',
  'Title': 'Scope',
  'Description': ['This Regulation applies to vehicles of category L.1',
   'These categories do not include: "Item"'],
  'Item': ['(a) Vehicles with a Vmax of < 25 km/h;',
   '(b) Vehicles equipped for disabled riders.']},
 'chapter 2': {'Chapter': '2',
  'Title': 'Definitions',
  'Description': ['For this Regulation:'],
   '2.1.': {'Description': ['"Antilock Brake System (ABS) " means a system that senses wheel slip and automatically modulates the pressure producing the braking forces at the wheel(s) to limit the degree of wheel slip.']},
  '2.2.': {'Description': ['"Approval of a vehicle " means the approval of a vehicle type with regard to braking.']},
  '2.3.': {'Description': ['"Baseline test " means a stop or a series of stops carried out in order to confirm the performance of the brake prior to subjecting it to a further test such as the heating procedure or wet brake stop.']},
  '2.4.': {'Description': ['"Brake " means those parts of the brake system where the forces opposing the movement of the vehicle are developed.']},
  '2.5.': {'Description': ['"Brake system " means the combination of parts consisting of the control, transmission, and brake, but excluding the engine, whose function it is to progressively reduce the speed of a moving vehicle, bring it to a halt, and keep it stationary when halted.']},
  '2.6.': {'Description': ['"Combined brake system (CBS) " means: "Item"'],
   'Item': ['(a) For vehicle categories L 1 and L 3: a service brake system where at least two brakes on different wheels are operated by the actuation of a single control.',
    '(b) For vehicle categories L 2, L 5, L 6, and L 7: a service brake system where the brakes on all wheels are operated by the actuation of a single control.',
    '(c) For vehicle category L 4: a service brake system where the brakes on at least the front and rear wheels are operated by the actuation of a single control. (If the rear wheel and sidecar wheel are braked by

규격화된 데이터를 바탕으로 json 형식으로 포멧팅 완료

JSONL 전처리

[{'chapter.5_Specifications': {'5.1.': {'Description': ['Brake system requirements'],
'5.1.1.': {'Description': ['Each vehicle shall meet each of the tests specified for a vehicle of its category and for those brake features on the vehicle.']},
'5.1.2.': {'Description': ['Service brake system control operation',
'Vehicles shall have configurations that enable a rider to actuate the service brake system control while seated in the normal driving position and with both hands on the steering control.']},
'5.1.3.': {'Description': ['Secondary brake system control operation',
'Vehicles shall have configurations that enable a rider to actuate the secondary brake system control while seated in the normal driving position and with at least one hand on the steering control.']},
'5.1.4.': {'Description': ['Parking brake system',
'If a parking brake system is fitted, it shall hold the vehicle stationary on the slope prescribed in paragraph 1.1.4. of Annex 3.',
'The parking brake system shall: "Item"',
'Vehicles shall have configurations that enable a rider to be able to actuate the parking brake system while seated in the normal driving position. For L 2, L 4, L 5, L 6, and L 7, the parking brake system shall be tested in accordance with paragraph 8. of Annex 3.'],
'Item': ['(a) Have a control which is separate from the service brake system controls; and',
'(b) Be held in the locked position by solely mechanical means.']},
'5.1.5.': {'Description': ['Two-wheeled vehicles of categories L 1 and L 3 shall be equipped with either two separate service brake systems, or a split service brake system, with at least one brake operating on the front wheel and at least one brake operating on the rear wheel.']},
'5.1.6.': {'Description': ['Three-wheeled vehicles of vehicles category L4 shall comply with the brake system requirements set out in paragraph 5.1.5. A brake on the sidecar wheel is not required if the vehicle meets the performance requirements prescribed in Annex 3.']},
'5.1.7.': {'Description': ['Three-wheeled vehicles of category L2 and four-wheeled vehicles of category L6 shall be equipped with a parking brake system plus one of the following service brake systems: "Item"'],
'Item': ['(a) Two separate service brake systems, except CBS, which, when applied together, operate the brakes on all wheels; or',
'(b) A split service brake system; or',
'(c) A CBS that operates the brakes on all wheels and a secondary brake system which may be the parking brake system.']}}}},

벡터 임베딩에 적합한 청크 사이즈(500 토큰)으로 json 파일을 분할

JSONL 전처리

- JSON 임베딩

Q: 'Where should the warning lights be installed?'

A: '"All warning lamps should be mounted in the rider's view."

- 순수 텍스트 임베딩

Q: 'Where should the warning lights be installed?'

A: '"All warning lamps should be mounted in the rider's view according to the provided context."'

이전 모델의 결과와 비교하는 과정을 진행 중

JSONL 전처리


```
{'query': 'Where should the warning lights be installed?',
 'result': "All warning lamps should be mounted in the rider's view.",
 'source_documents': [Document(metadata={'seq_num': 44, 'source': '/content/R078r3e_fullChapter_chunked_ver1.jsonl'},
page_content='{"chapter.5_Specifications": {"5.1.": {"Description": ["Brake system requirements"], "5.1.17.": {"Description": ["Generation and
deactivation of the braking signal to illuminate stop lamp(s) as defined in UN Regulation No. 53 shall only be under the following conditions:"],
"5.1.17.1.": {"Description": ["Application of any service brake by the rider shall generate a braking signal that will be used to illuminate the stop
lamps."]}, "5.1.17.2.": {"Description": ["In addition, in the case of vehicles powered solely by electric powertrains equipped with electric regenerative
braking systems as defined in paragraph 2.32. of this Regulation, which produces a retarding force upon release of the accelerator control, the braking
signal shall be generated also according to the following provisions:"]}}, "5.1.18.": {"Description": ["A vehicle fitted with an ABS system active on both
axles may be fitted with a rider-selectable mode to deactivate the ABS function on the rear axle. When the ABS function is deactivated on the rear axle
this shall be indicated by a yellow or amber tell-tale or check control messages5 according to one of the following methods until the ABS is fully
functional or operating on both axles again:"], "Item": ["(a) The following symbol as specified in B.18 in ISO 2575:2010:", "(b) The following symbol as
specified in B.18 in ISO 2575:2010:", "(c) The following symbol as specified in B.05 of ISO 2575:2010:", "(d) The text ₩₩" REAR ABS OFF₩₩", or ₩₩" REAR
ABS not available₩₩"; or", "(e) The warning lamp referred to in paragraph 5.1.13., continuously flashing. If the disablement of the ABS system is also
indicated by a flashing of this warning lamp as specified in 5.1.16. e -iv, the frequency of the flashing for indicating the deactivation of the ABS
system on one disablement of the ABS system."]}}}}')
```

전문과 개정안 병합

- 개정안을 전문에 합치기

1. 전문 word 파일 찾기

: word 파일을 찾기 힘들 때, 기존 pdf 자료를 활용함. pdf 파일일 때, 수정할 수 없어서 이런 식으로 결정함.

2. 개정안 부분을 전문 word 파일에 병합함.

: 전처리 없이 그냥 텍스트로만 인식을 하였는데, 인식은 하나 다수의 정보를 누락한채 답변함

3. JSONL, Markdown을 위해서 개정안 내용을 넣는 코드 진행

: 마크다운, JSONL 다르게 진행하기 때문에 그에 맞춰서 개정안 내용을 넣을 수 있게 하는 코드

RAG프로토타입 및 평가요소

RAG가 얼마나 효과적으로 동작하는지를 평가하기 위함

주요 평가 지표 및 기능(Key Metrics and Abilities)

답변의 충실성(Faithfulness)

답변 관련성(Answer Relevance)

문맥 관련성(Context Releavance)

RAG프로토타입 및 평가요소

RAGAS

RAG pipline을 평가하는 프레임워크

사용자 질의와 유사한 문맥을 식별하는 검색 시스템의 능력, 검색 결과를 잘 사용하는 LLM의 능력, 생성된 답변의 품질이라는 3가지 주요 측면에 중점을 두고 평가

RAGAS

RAG 평가질문 생성

RAG 프로세스 구성

RAG 평가

평가용 깃허브 라이브러리 제공