2020년 한양대학교

소프트웨어융합 종합학술대회

[분야 : 인턴십/캡스톤]

제목: The Data Civilizer System

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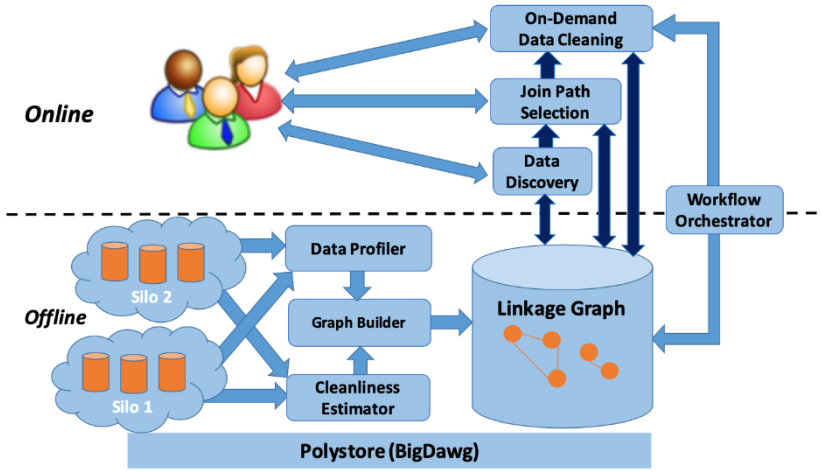
The Data Civilizer System



end-to-end 빅데이터 관리 시스템

Linkage Graph

데이터에 대한
링크 그래프 구축

Discovery

링크 그래프를 활용하여
사용자 작업에 관련한 데이터 식별

- 링크 그래프를 사용하여 join path 찾기
- 실제 query 실행에서 polystore DBMS사용
- 데이터 클리닝 작업을 query에 통합

Data preprocessing

- 결측치 제거

```
def cleanliness(df):
    for x in df.columns:
        df[x] = df[x].apply(lambda x: None if x == "null" else x)
        if 'int64' == df[x].dtype:
            lis = list(df[x])
            for i in range(len(lis)):
                df = validate(x, df, lis[i])
            IQR(df, x, lis)
    return df
```

- Outlier 제거

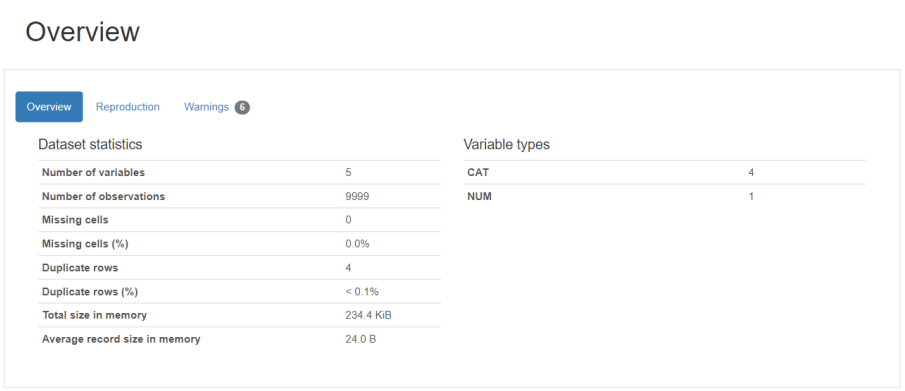
```
def validate(x, df, date):
    try:
        datetime.datetime.strptime(str(date), '%Y%m%d')
    except ValueError:
        df[x] = df[x].replace(date, np.nan)
    return df
```

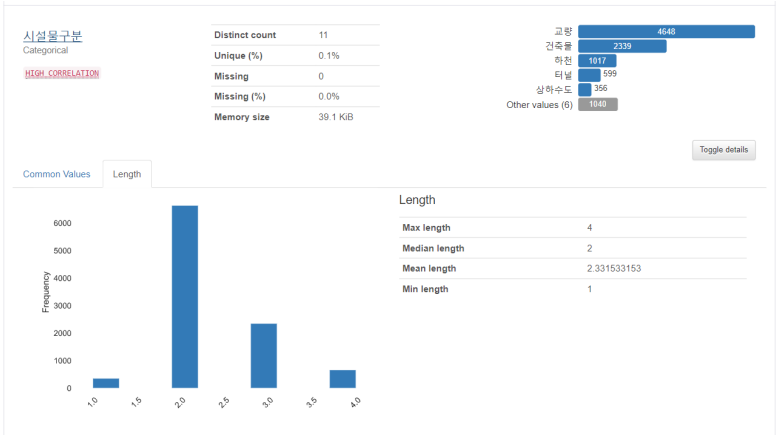
- 날짜 데이터 유효성 검사

```
def IQR(df, x, lis):
    Q1 = df.quantile(.25)
    Q3 = df.quantile(.75)
    IQR = Q3 - Q1
    for i in range(len(lis)):
        if ((df[x] < (Q1 -  1.5 * IQR)) | (df[x] > (Q3 + 1.5 * IQR))):
            df[x] = df[x].replace(lis[i], np.nan)
    return df
```

Data Profiling : pipeline 구조

- pandas_profiling 라이브러리를 사용하여 profiling진행 및 메타 데이터 추출

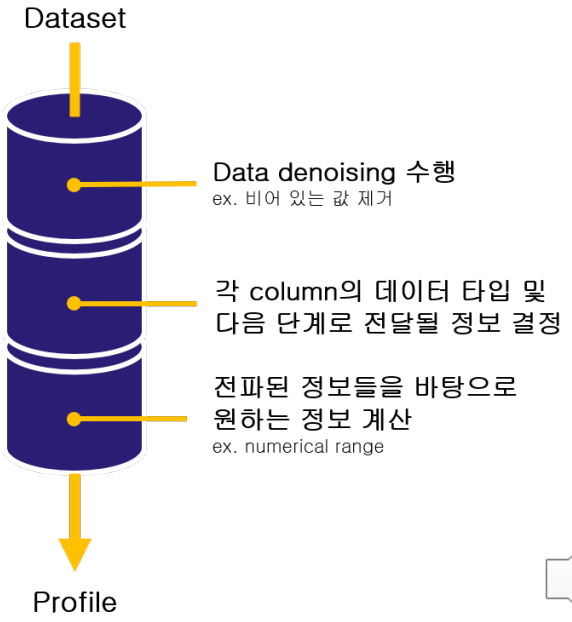




- 칼럼 간 유사성 및 inclusion dependency 계산 구현

```python
def col_similarity(table1, table2):
    res = {}
    col_sim = []
    ind = []
    for x in table1:
        for z in table2:
            top = 0
            dict(x[3])
            dict(z[3])
            top_key = x[3].keys()
            bottom_key = z[3].keys()
            for y in top_key:
                if y in bottom_key:
                    top += min(int(x[3][y]), int(z[3][y]))
            bottom = int(x[1]) + int(z[1]) - top # column1 + column2 - (col1과 col2의 교집합)
            if (top != 0 and bottom != 0):
                col_sim += [[x[0],z[0], float(top / bottom)]]
    if(len(col_sim) != 0):
        res['column_similarity'] = col_sim
    return res

def inclusion_dependency(table1, table2):
    res = {}
    ind = []
    for x in table1:
        for z in table2:
            dict(x[3])
            dict(z[3])
            top_key = x[3].keys()
            bottom_key = z[3].keys()
            if len(set(top_key) & set(bottom_key)) != 0:
                IND = float(
                    len(set(top_key) & set(bottom_key)) / len(set(top_key)))  ## col_name의 교집합 / x의 집합 == 1일 경우 IND 성립
                if IND == 1:
                    ind += [[x[0], z[0], 'IND']]
    if (len(ind) != 0):
        res['inclusion_dependency'] = ind
    return res
```



Data Update

- 데이터베이스 쿼리로그를 읽어와서 업데이트가 된 테이블에 대하여 프로파일링 재진행
- 기존 프로파일링과 비교하여 바뀐 사항 업데이트

DB의 query log

```
SELECT * FROM mysql.general_log ORDER BY event_time DESC LIMIT 5;
```

event_time	user_host	thread_id	server_id	command_type	argument
2020-09-06 00:11:43.867121	root[root] @ localhost [::1]	8	1	Query	SELECT * from mysql.general_log
2020-09-06 00:12:33.792293	[root] @ localhost [::1]	9	1	Connect	root@localhost as anonymous on capstone
2020-09-06 00:12:33.795262	root[root] @ localhost [::1]	9	1	Query	SET AUTOCOMMIT = 0
2020-09-06 00:12:33.795886	root[root] @ localhost [::1]	9	1	Query	SHOW TABLES
2020-09-06 00:12:33.798075	root[root] @ localhost [::1]	9	1	Query	DROP TABLE test1

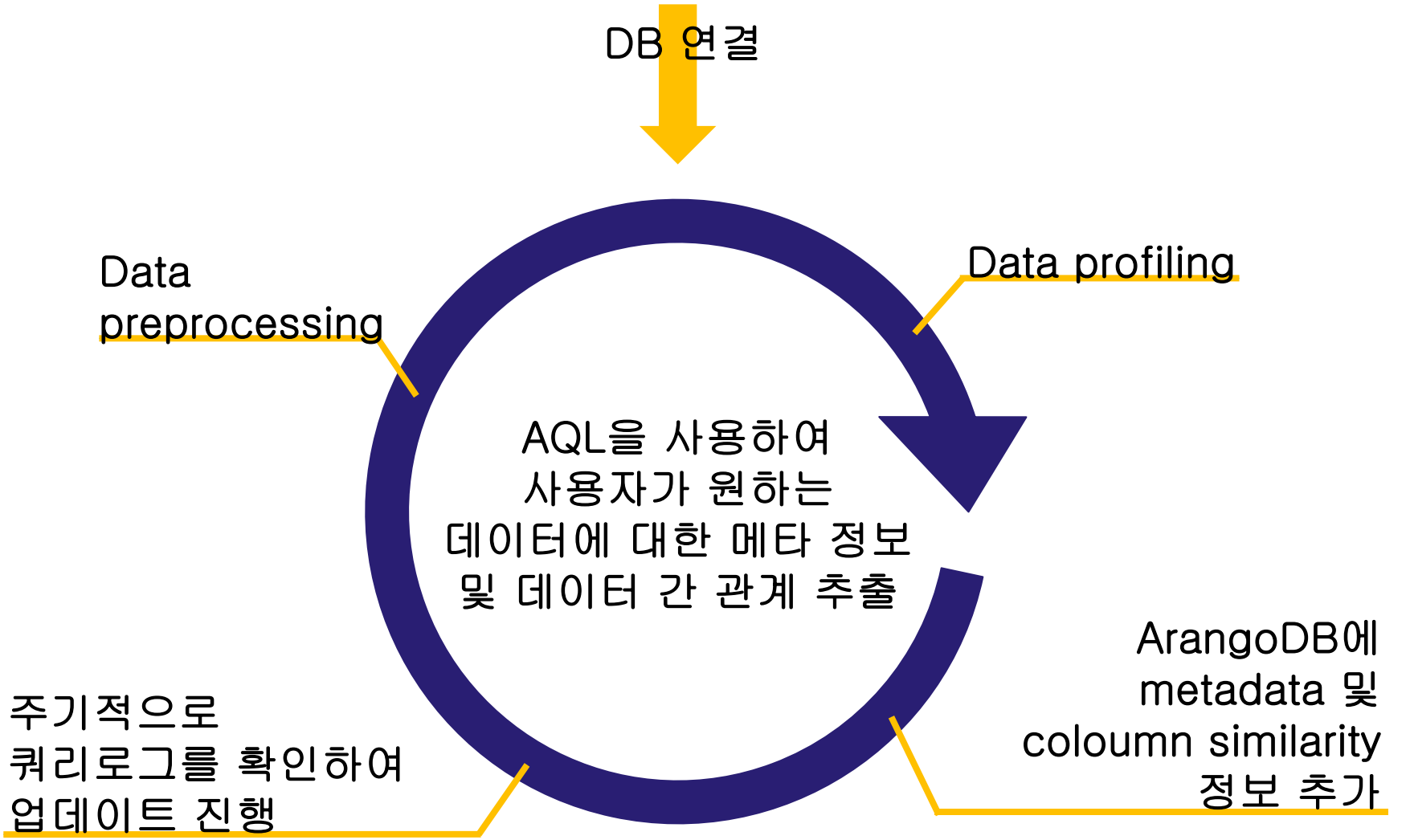
저장되어 있는 마지막 쿼리문의 시간보다 최근의 쿼리문만 모두 불러오기

```
SELECT *
FROM mysql.general_log
WHERE event_time > '2020-09-06 00:14:55'
ORDER BY event_time DESC;
```

```
INSERT INTO test3 (Name, Classification, Type)
VALUES ('07WK35D12900', '절토사면', '도로사면')
```

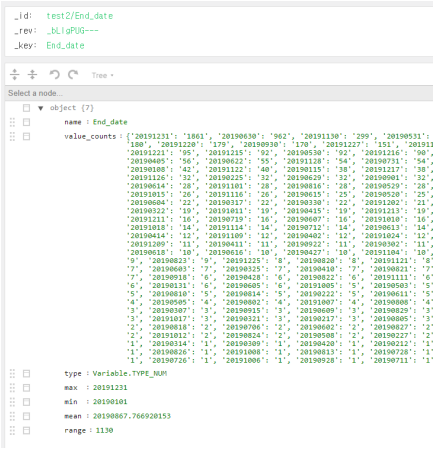
불러온 쿼리문에서 테이블명 추출
-> profile 진행

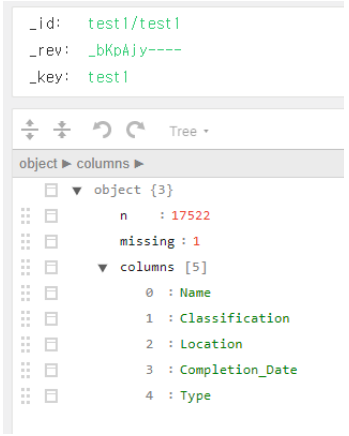
Data Civilizer System Structure



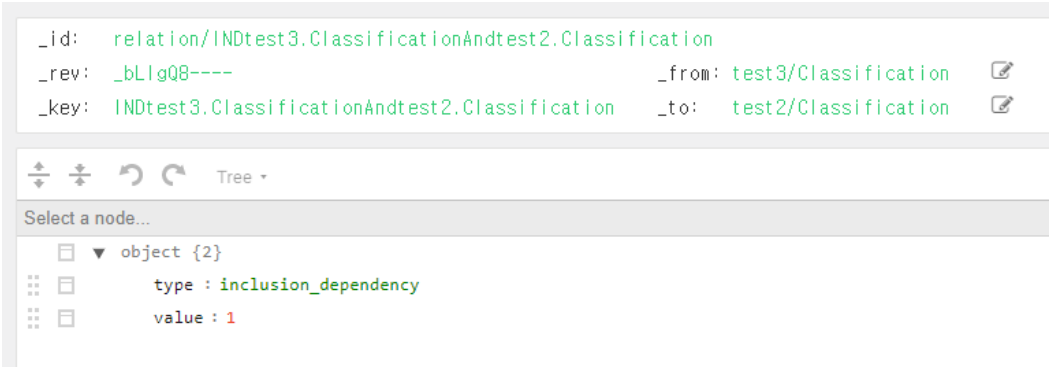
Data Civilizer 구현 결과

- ArangoDB에 테이블의 메타데이터 입력



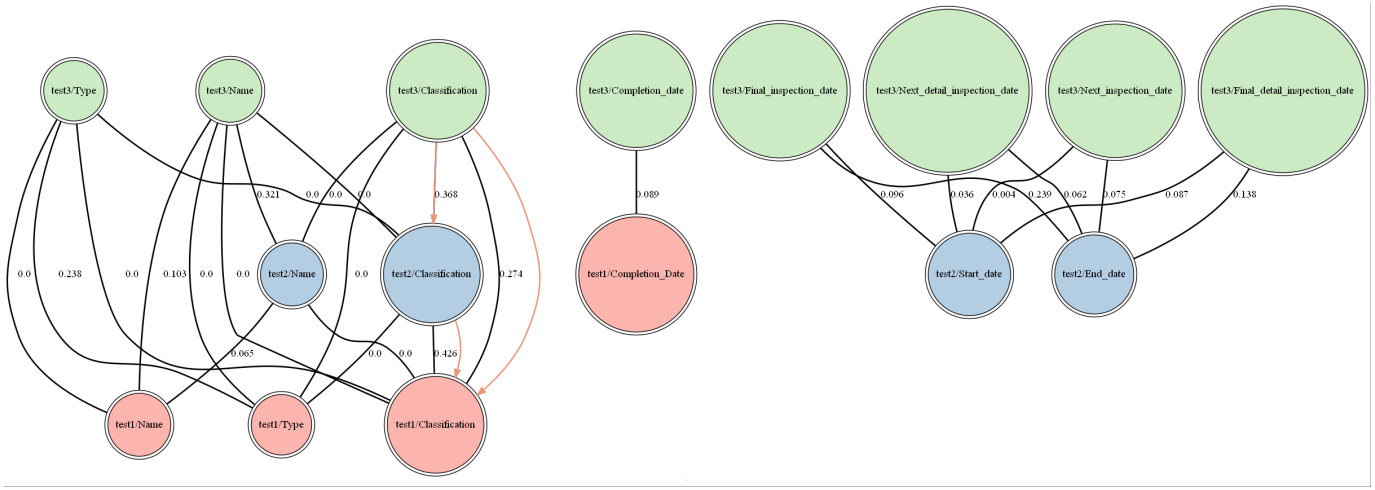


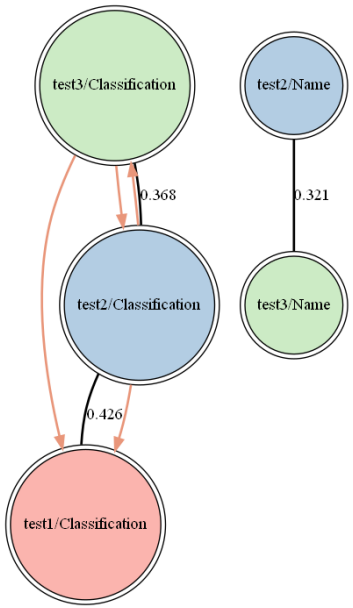
- 칼럼간 유사성 및 inclusion dependency 데이터 입력



Data Civilizer 구현 결과

FOR x IN relation RETURN x





FOR x IN relation FILTER x.value > 0.3 RETURN x