KOREA 2021

DISCOVERY SUMMIT

EXPLORING DATA
INSPIRING INNOVATION

SQLite DB와 TOPSIS 신경망모델을 적용한 수상함 초기설계 최적화 프로세스

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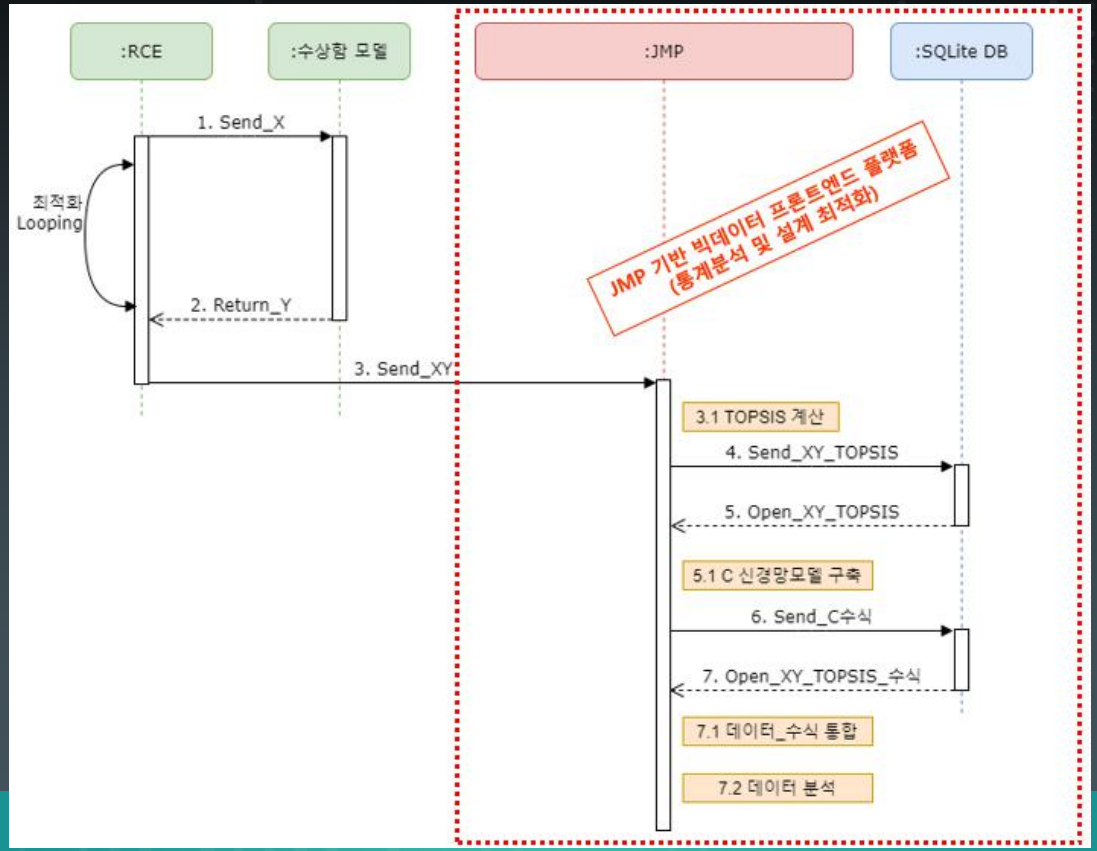
과제 개요(Sequence Diagram)



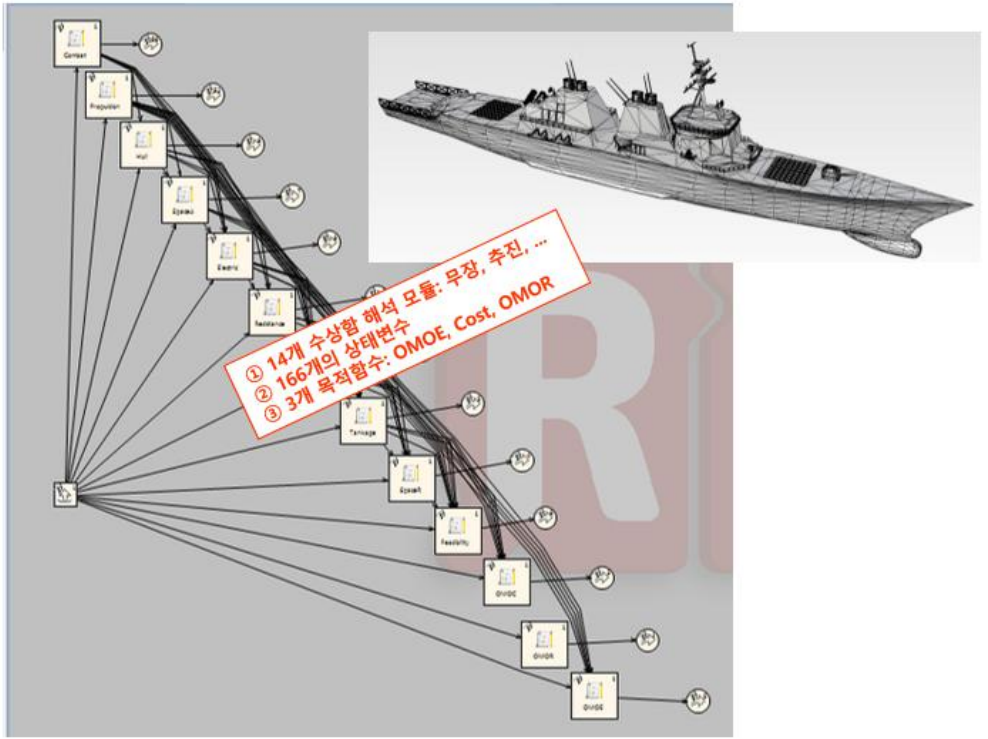
1. RCE 통합설계 프레임워크: 수상함모델 통합 및 설계 최적화

RCE
프로세스 자동화

Pymoo NSGA-II
MOGA

SQLite DB 저장

JMP
신경망모델 구축
설계최적화



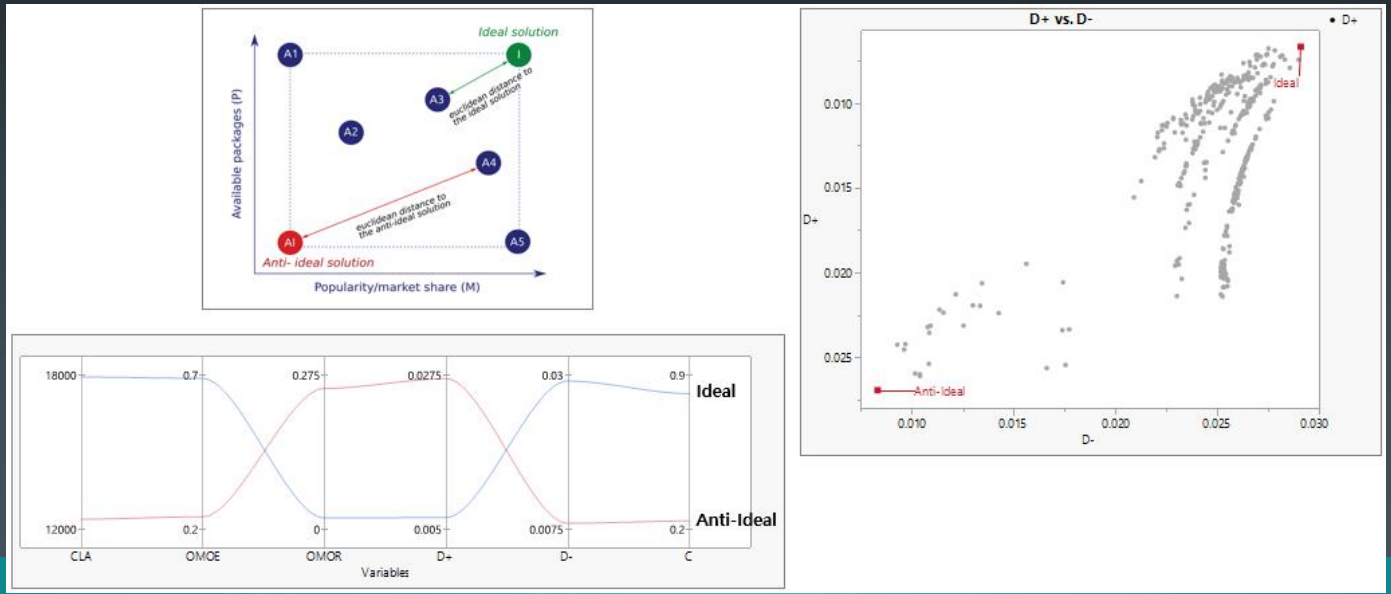
2. 수상함 초기설계 DB

2.1 TOPSIS(Technique for Order of Preference by Similarity to Ideal Solution) 신경망모델 구축

> MCDA(Multi-Criteria Decision Analysis)

- 3개 목적함수를 하나의 성능지표로 표현

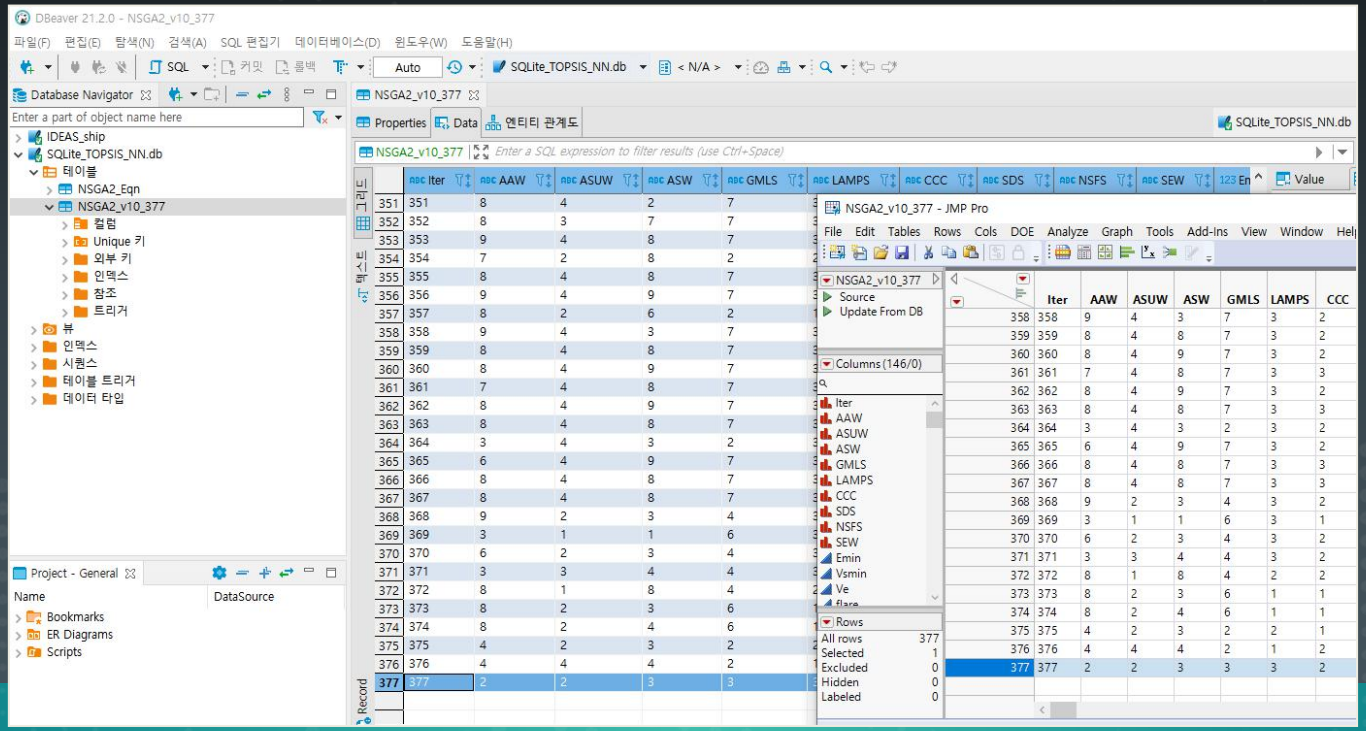
> D+(이상해 Ideal)에 가깝고, D-(반이상해 Anti-Ideal)에서 먼 성능지표: Min D+, Max D-



2. 수상함 초기설계 DB

2.2 SQLite DB

> data table("NSGA2_v10_377") << Save Database(dsn, "NSGA2_v10_377");



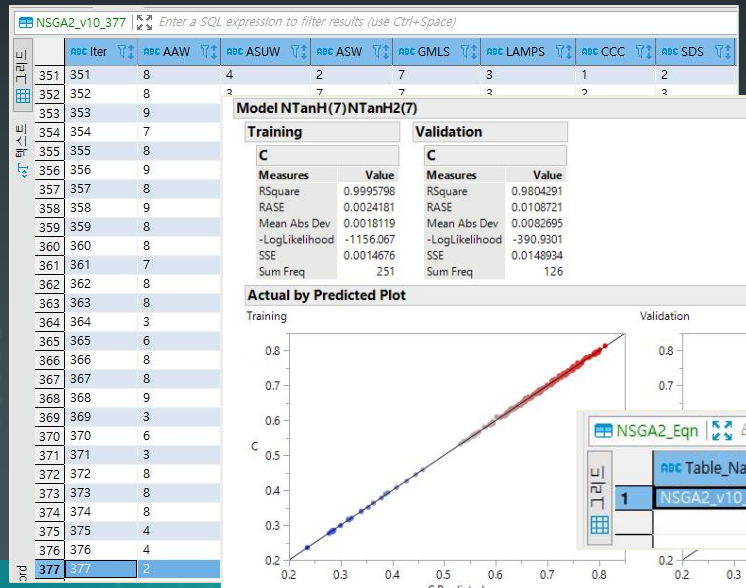
3. 신경망모델

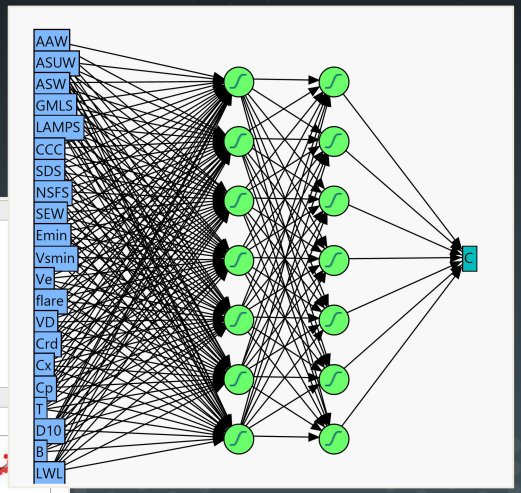
3.1 DB 기반 신경망모델 구축

> **Open Database**(dsn, "SELECT * FROM NSGA2_v10_377", "NSGA2_v10_377");

> TOPSIS 신경망모델 구축

> data table("NSGA2_Eqn") << **Save Database**(dsn, "NSGA2_Eqn");

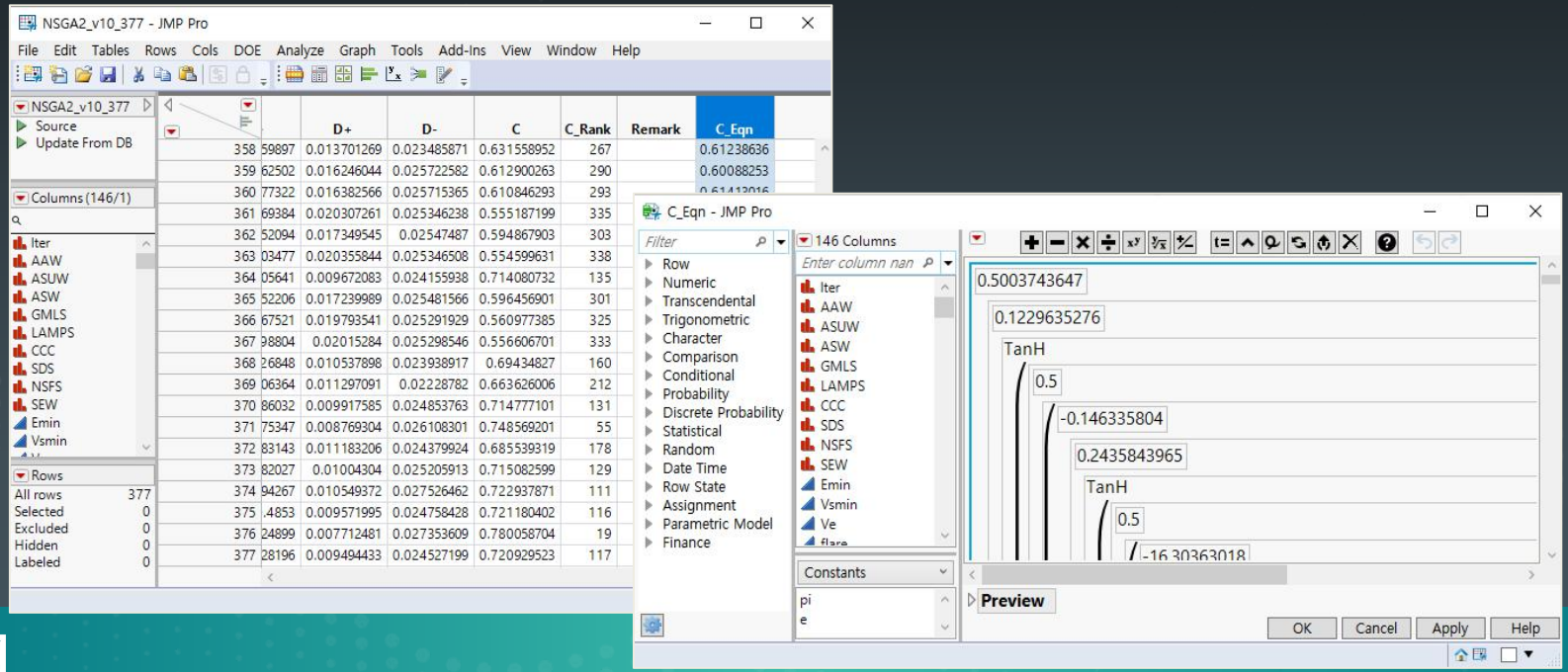




4. 수상함 초기설계 DB 분석

4.1 DB 데이터와 수식 결합 자동화

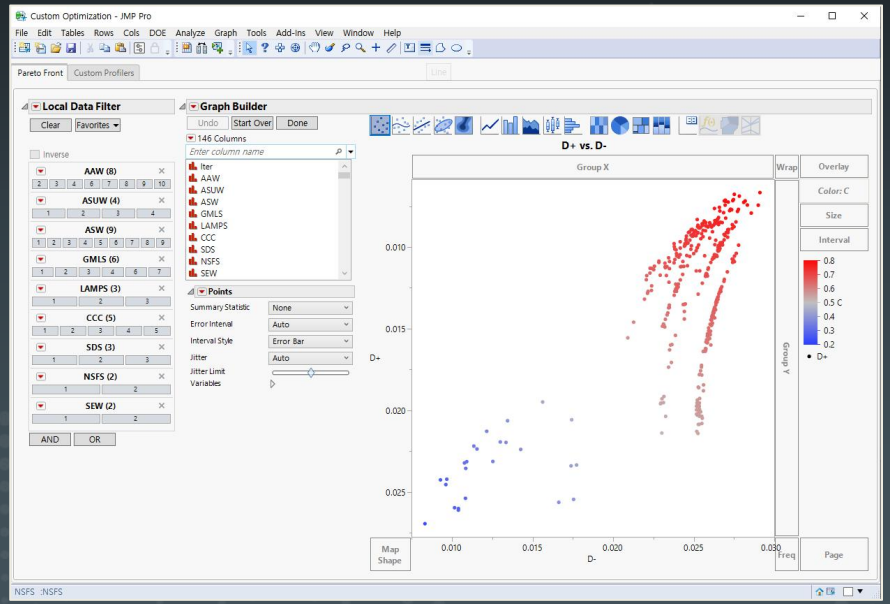
```
> eqn = data table("NSGA2_Eqn"):Eqn[1];
> data table("NSGA2_v10_377") << New Column( "C_Eqn", formula( eqn ) );
```

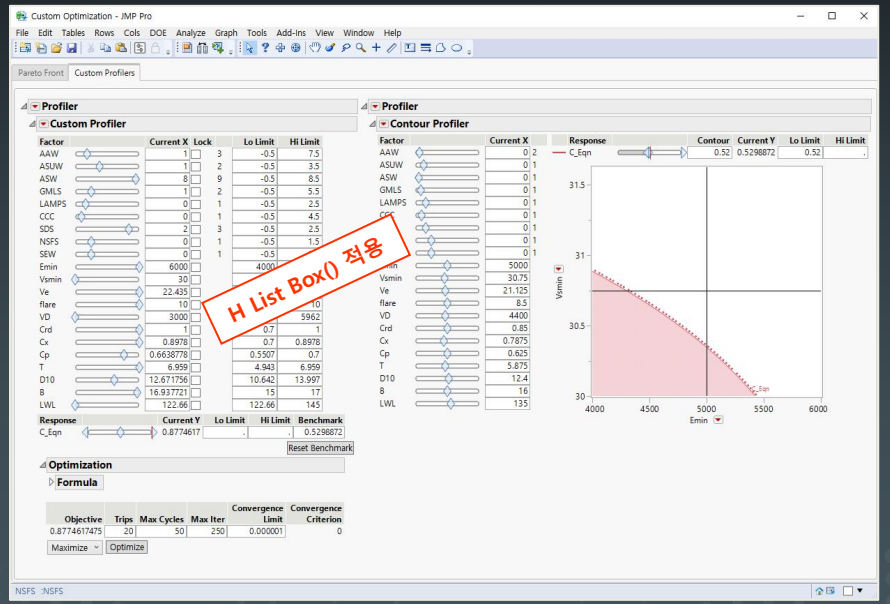


4. 수상함 초기설계 DB 분석

4.2 DB 데이터 기반 분석 결과 대시보드

```
> nw = New Window("Custom Optimization", tb = Tab Box());
  tb << Append( ...
```



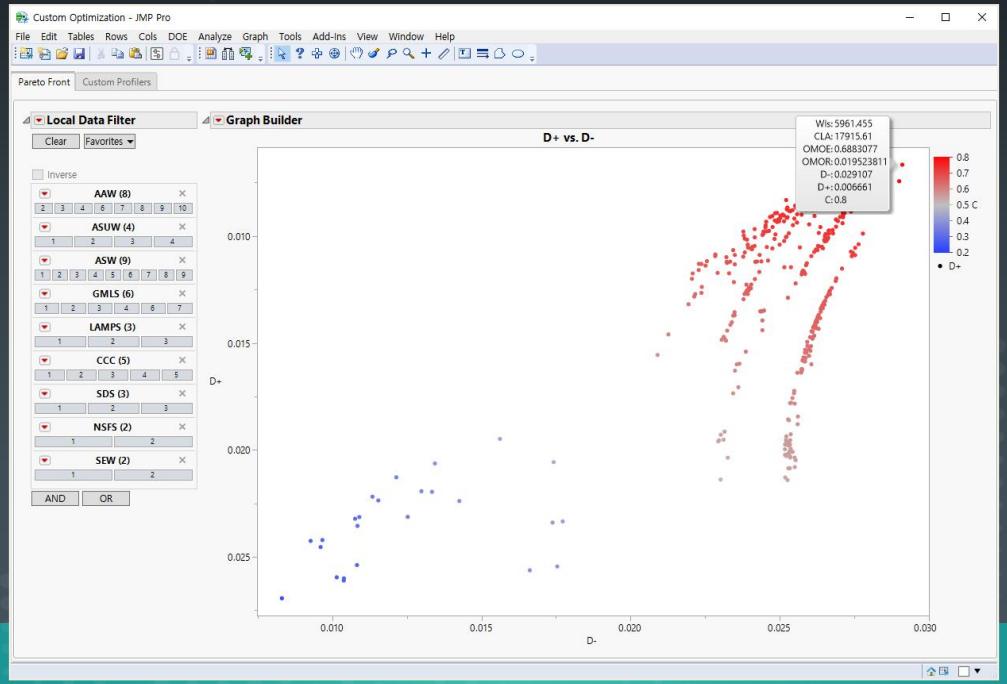


4. 수상함 초기설계 DB 분석

4.3 Pareto Front

> Local Data Filter

- 대공전(AAW), 대함전(ASW), 대잠전(ASUW), 지상지원 등

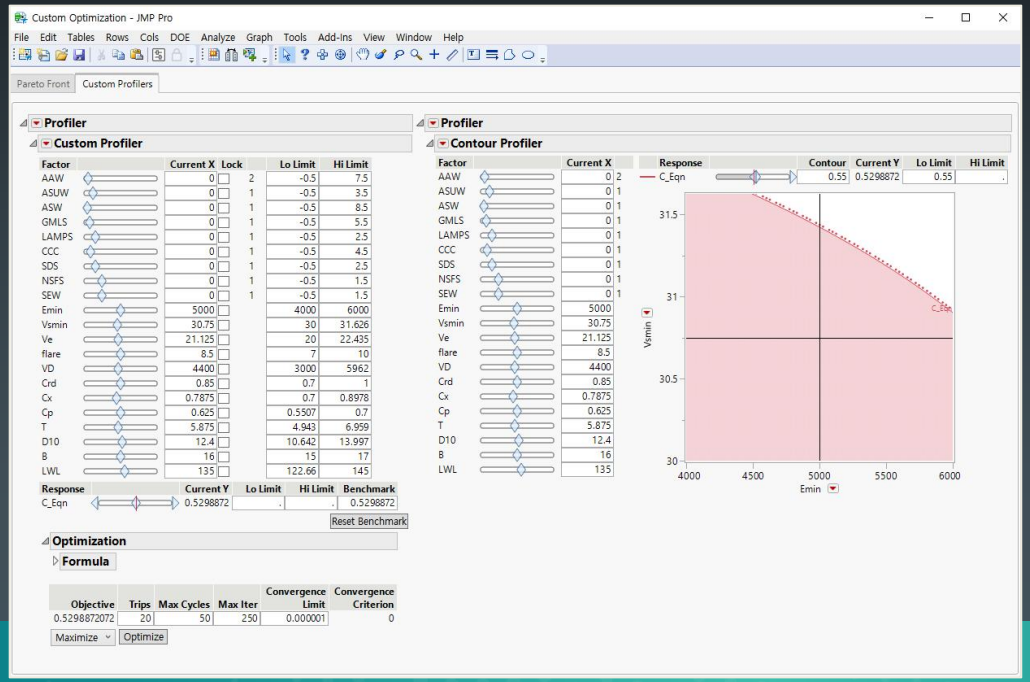


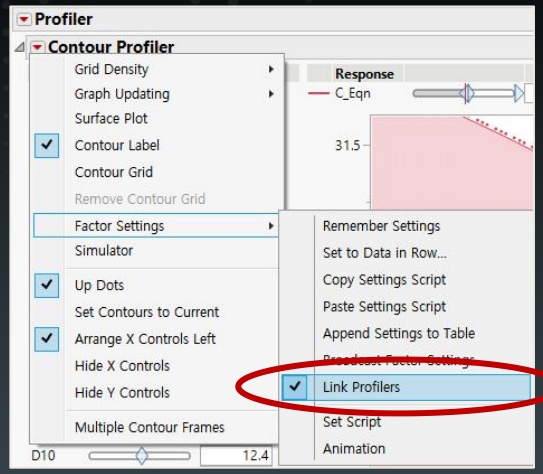
4. 수상함 초기설계 DB 분석

4.4 Custom Profilers

> MCDA => Single Performance Index => Desirability Function 적용 가능

> Custom profiler와 Contour Profiler를 **Link Profilers** (매개변수 연동화)



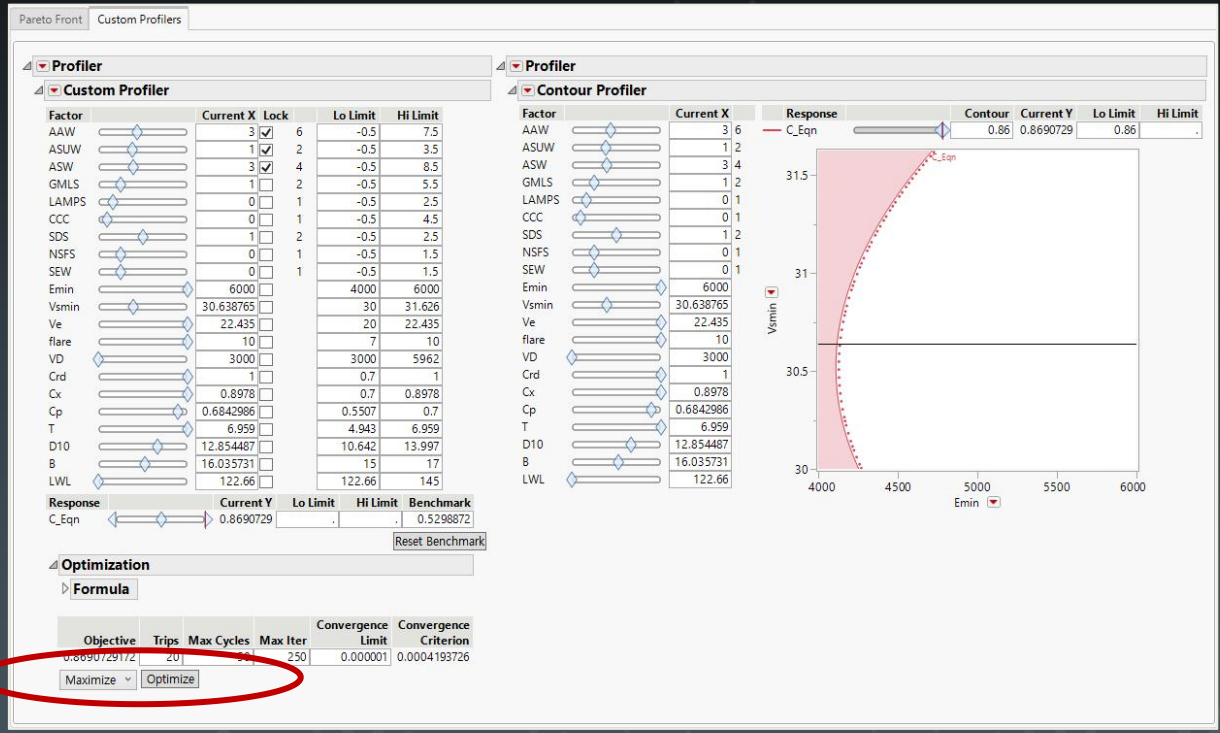


4. 수상함 초기설계 DB 분석

4.4 Custom Profilers

> 설계 최적화 진행

- 고정: AAW=3, ASUW = 2, ASW = 3
- 만족도함수: 0.53 => 0.89로 향상



결 론

1. 시뮬레이션 데이터의 DB화
   - SQLite, MariaDB
2. JMP Front-End Design Platform 구축
   - 통계분석 및 최적화 가능

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