

쇼핑카트의 최적설계

조이름: 카트타시조

조원: 이기영 남상준

Contents

1. Project/Problem Statement
2. Data and Information Collection
3. Identification/Definition of Design Variables
4. Identification of a Criterion to Be Optimized
5. Identification of Constraints
6. Use of Matlab for Graphical Optimization
7. Discussion



Project/Problem Statement

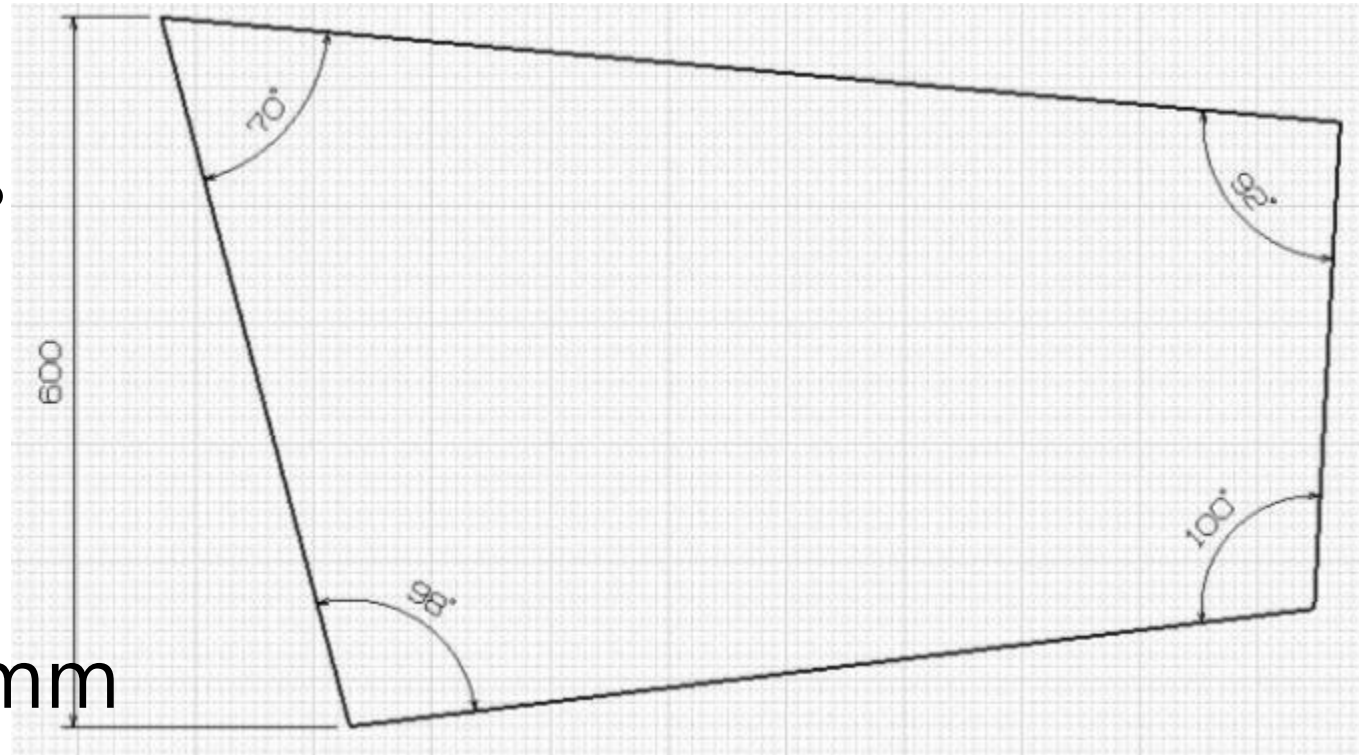
■ 쇼핑 카트 설계 목적

- 카트 보관시의 공간 차지 최소화

- 카트의 적재 부피 최대화

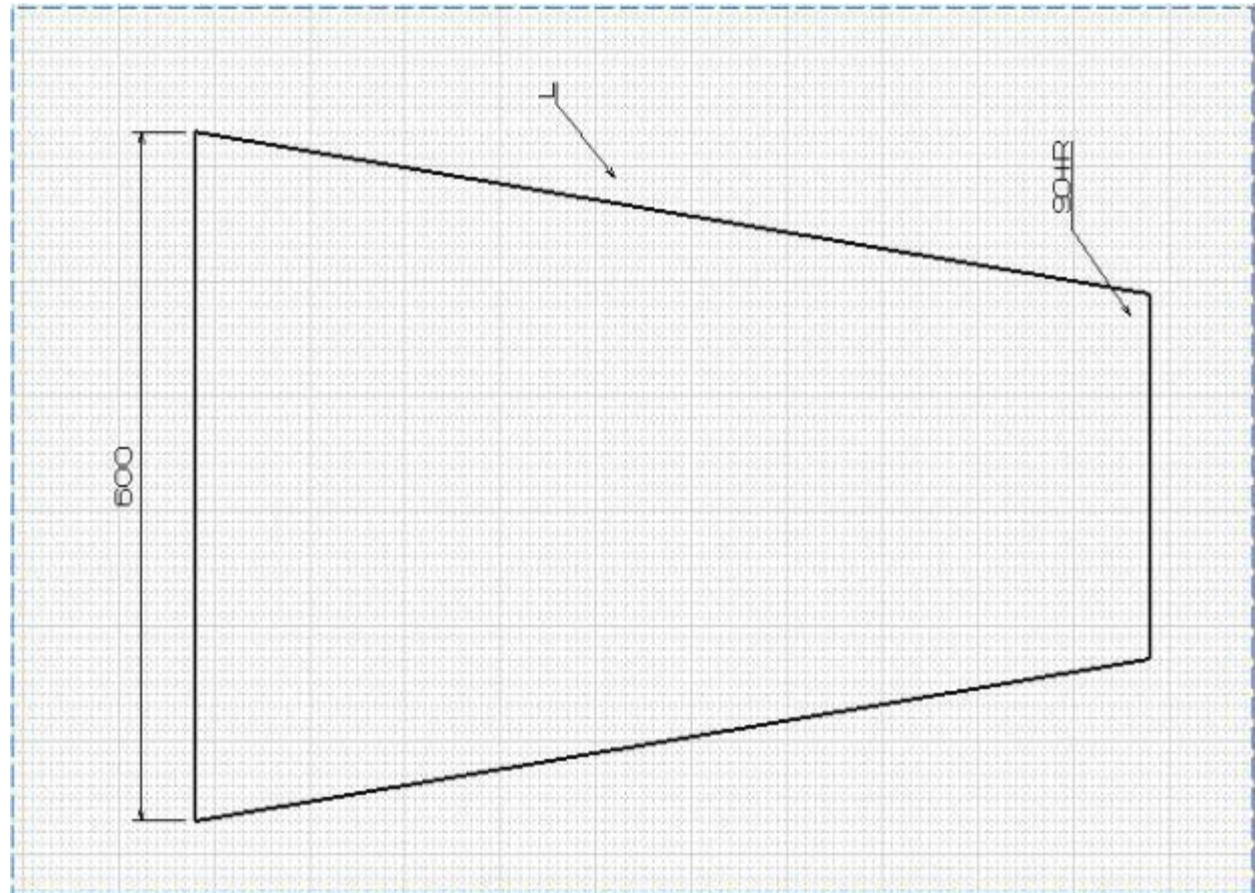
Data and information collection

- $\theta_1 = 98^\circ$
- $\theta_2 = 100^\circ$
- $\theta_3 = 92^\circ$
- $\theta_4 = 70^\circ$
- $h = 600 \text{ mm}$



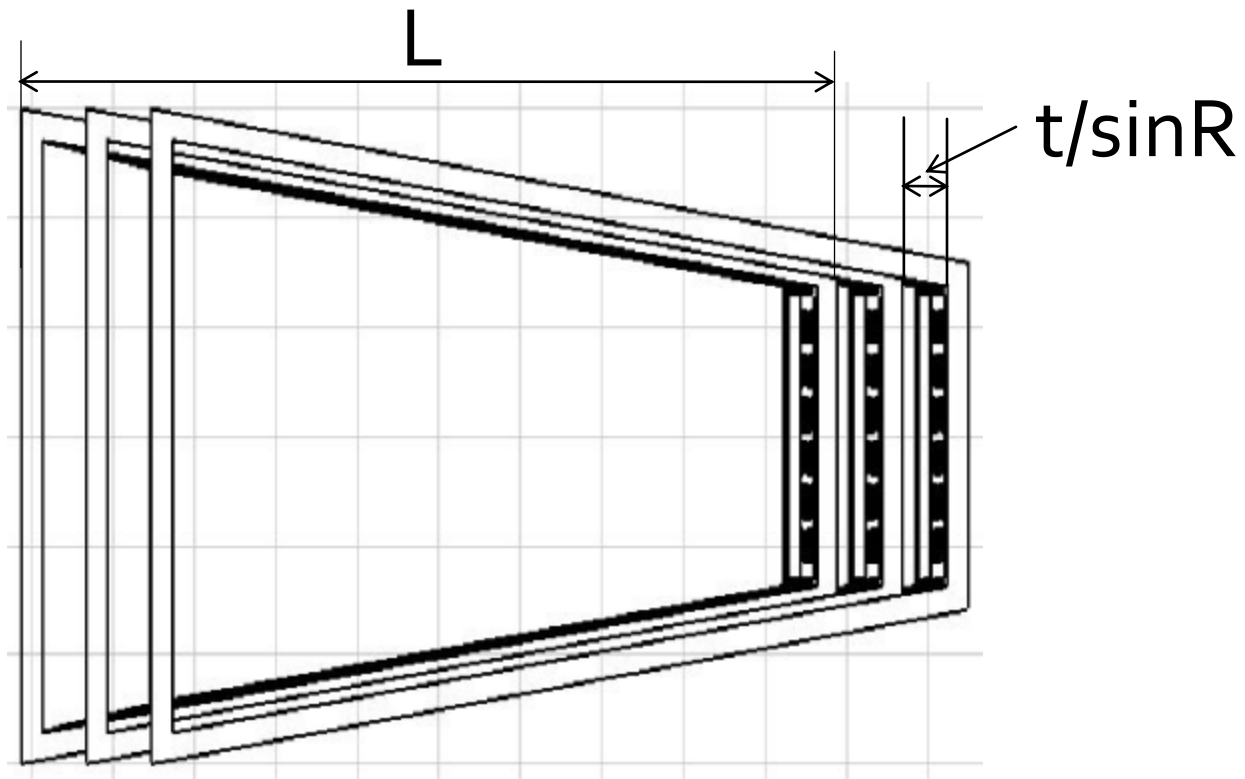
Data and information collection

- $b=600\text{mm}$
- $t=15\text{mm}$

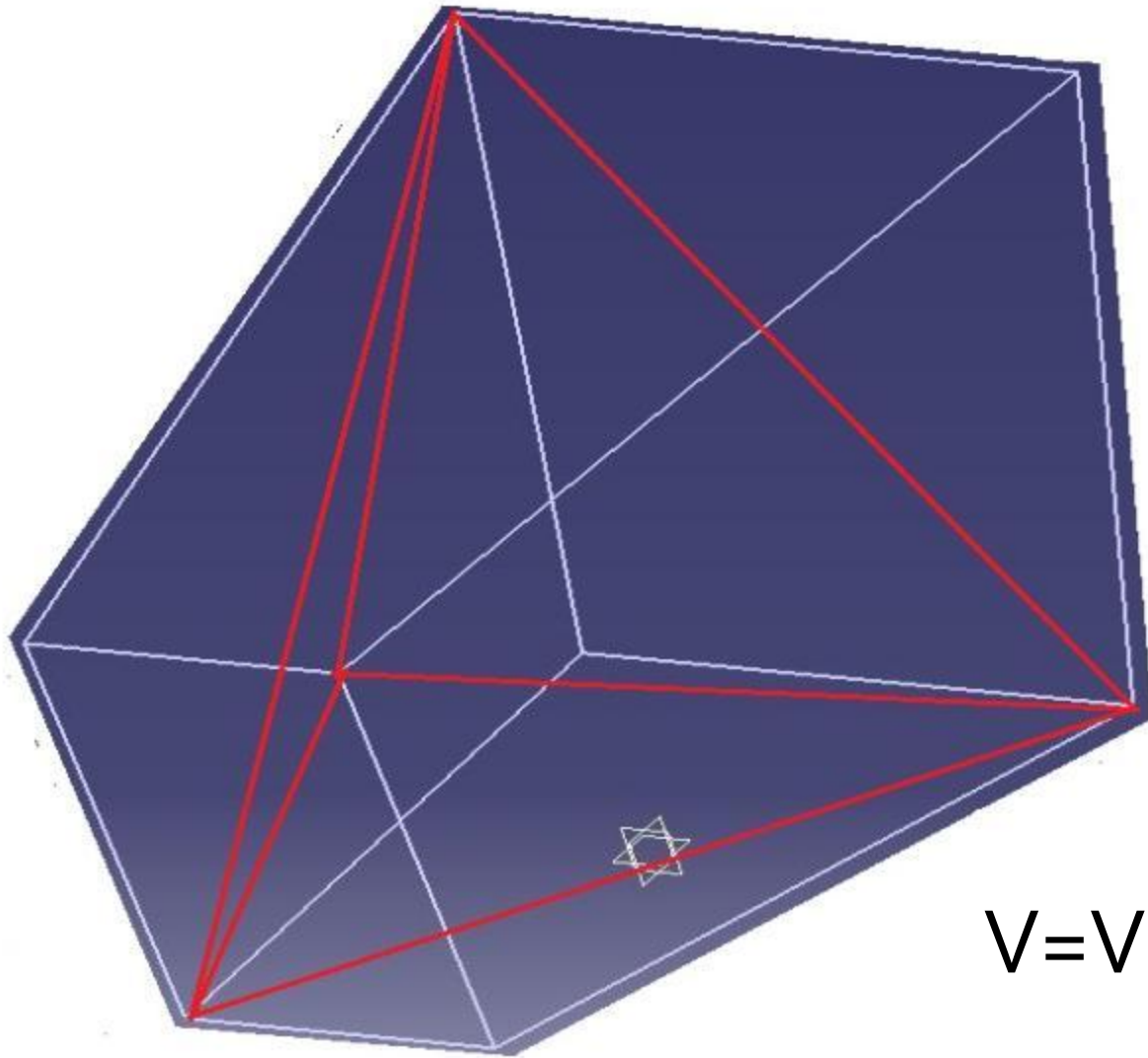


Data and information collection

- 50대당 소요공간 : $L50 = L + 49 \times \frac{t}{\sin R}$



Data and information collection

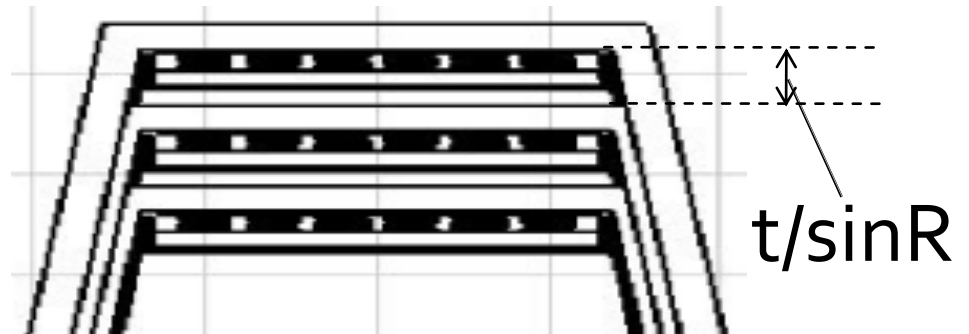
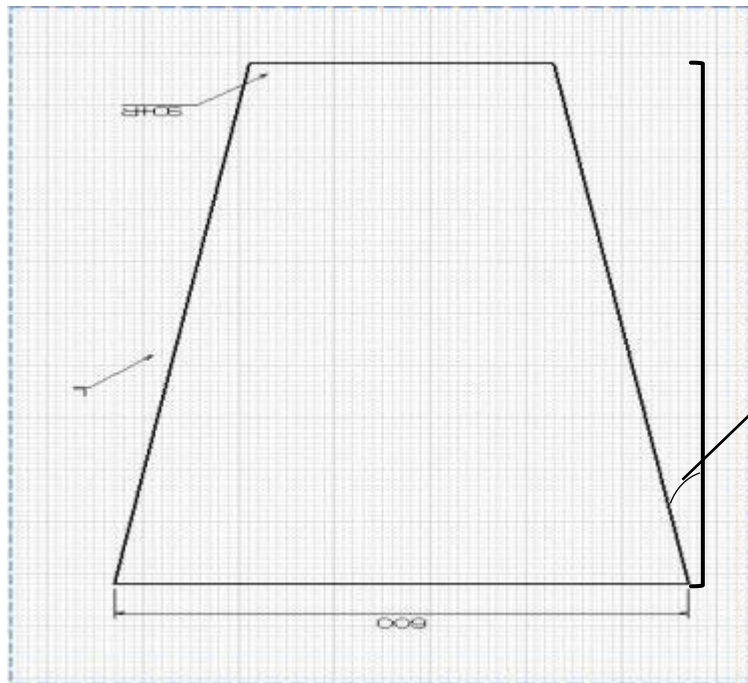


부피 :

$$V=V_1+V_2+V_3+V_4+V_5$$

Identification of a Criterion to Be Optimized

$$\text{minimize } f = k \frac{t}{\sin R} + L \tan R$$



Identification of Constraints

$$g1 : \left(L + 49 \times \frac{t}{\sin R} \right) - (9.399L + 994.2) \leq 0$$

$$g2 : (0.465L - 306.7) \times 10^6 - V \leq 0$$

$$g3 : L \times \tan R - \frac{b}{2} \leq 0$$

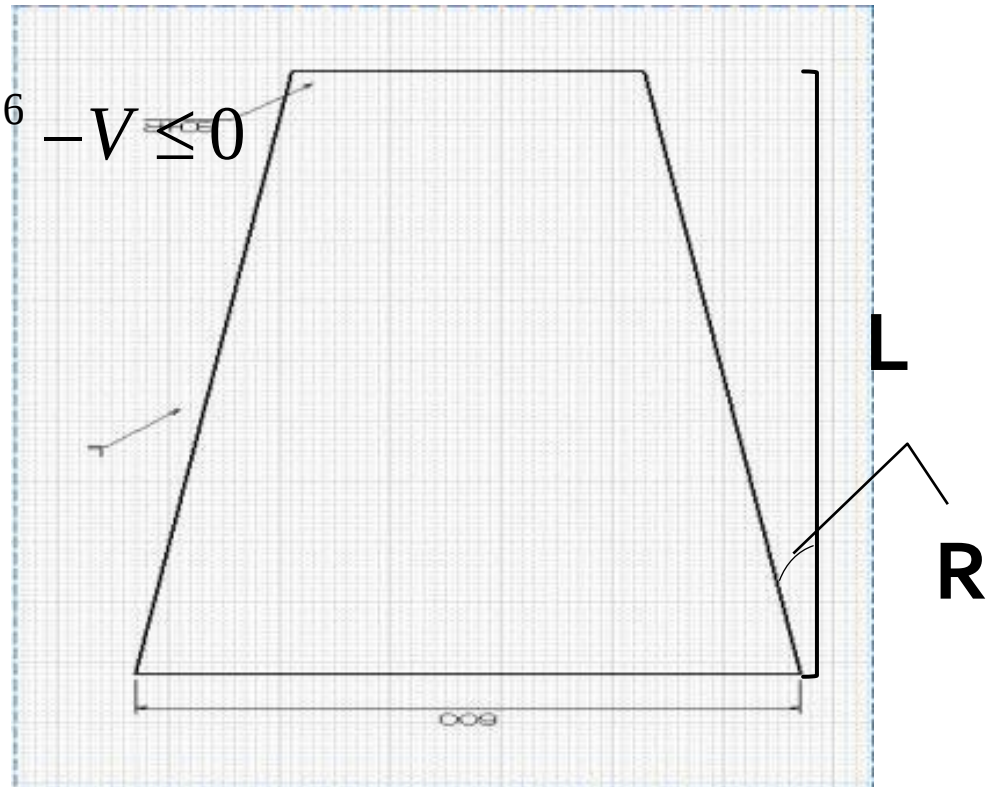
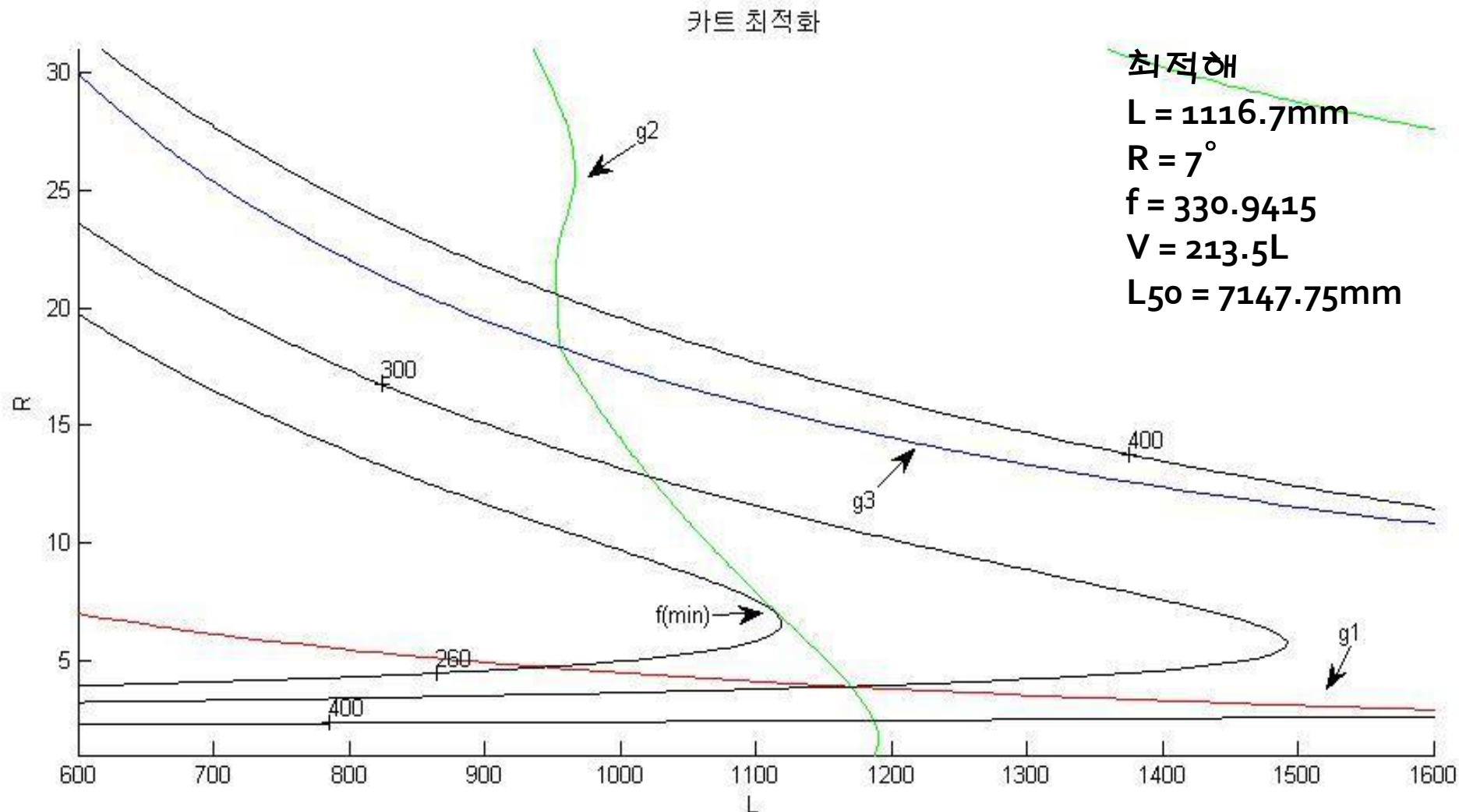


Figure of the Actual Cart

품명	83ℓ	90ℓ	101ℓ	120ℓ	150ℓ	180ℓ
구분						
전장(mm)	830	830	910	910	1005	1015
폭(mm)	560	560	600	620	620	620
높이(mm)	932	952	947	995	980	1015
바스켓용량(ℓ)	80	88	102	119	153	180
바퀴지름(mm)	100	100	100	125	125	125
무게(mm)	15	18	20	21	21	22
대당소요공간(mm)	155	155	195	185	190	185
10대당소요공간(mm)	2,220	2,220	2,660	2,570	2,710	2,680
50대당소요공간(mm)	8,420	8,420	10,460	9,970	10,310	10,080

최소자승법을 통해 실제 카트를 L에 대한 함수로 표현

Use of Matlab for Graphical Optimization



Discussion

■ 실제 카트와의 비교

	전장길이 (mm)	용량(ℓ)	50대 소요 공간	뒤 폭(mm)	앞 폭(mm)
실제카트	1015	180	10080	575	366
설계카트	1116.7	213.5	7147.75	600	333

■ 더 고려해야 할 점

응력, 편의성, 다목적함수 최적화 방법

Reference

- Introduction to Optimum Design / Jasbir S. Arora / ELSEVIER
- CS 쇼핑 카트 인터넷 판매정보
http://www.gmarket.co.kr/challenge/neo_affiliate/naver/naver_redirect.asp?goodscode=169112779&GoodsSale=Y&jaehuid=200001171&nv_pchs=2hLE5%2FpzWCeo6ejjwnvDaRyjXaz%2FpSCsd8%2BtpCYwPJA%3D

Thank you!

