

ÇÖZÜMLERİYLE YARIM-MODEL ÖRNEKLERİ

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Yarım model, model ayarı için gerekli normal dağılımlı 5 veya 6 noktadan iki veya daha fazla noktasının ayarlarda çeşitli nedenlerle (Deniz, bulut göl vs.) kullanılamaması durumundaki modellerdir.

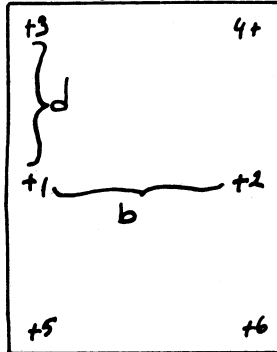
Karşılıklı yöneltmeden amaç, uzayda fotoğraf alınırken kamera projeksiyon merkezine gelen ışın demetinin aslına yakın olanını, kıymetlendirme aletlerinde elde etmektir. Yani, bilinmeyen 5 karşılıklı yöneltme elemanını bulmakla modelimiz'de "Colinearity" şartını sağlayarak her iki fotoğrafta aynı noktaya ait olan ışınların projeksiyon merkezinden geçerek (epipolar düzlem içinde) modelimizde tek bir noktada birleşmesini temin etmektir.

1. Karşılıklı yöneltme esasları

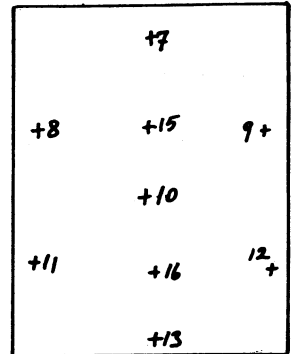
1.1. Kamera taşıyıcıları üzerine kazılmış ve artıklık şeklinde olup 6 adet ayar noktaları (Gruber ayar noktaları) ki bunların 1 ve 2 numaralıları, sol ve sağ resim orta noktasına (Asal noktaya) karşılık gelir.

1.2. Yarım modellerde, ilave 9 noktanın sıralanışı Matrix şeklinde olup, ilk 6 asıl noktaların ortasına gelecek şekilde dağıtılmışlardır.

Normal Modelimizdeki nokta yerleri



Yarım Modeldeki ilave nokta yerleri



Stereoskopik
Model
(Stereogram)

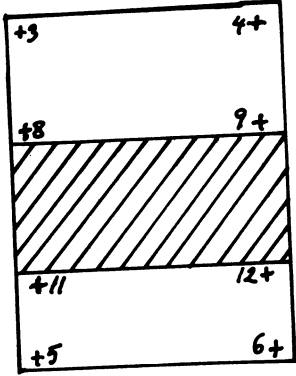
1.3. Normal durumlarda karşılıklı yöneltme

$d > b$ şartını sağlaması gerekir

bunada b fotoğrafbaşı % 60 bindirmeli olarak 90 mm.

d ise (23x23 cm) fotoğraflar için 110 mm alınabilir.

Bir yarım Modelin örnekle çözümü



- 1.9 Nolu noktada Paralaksayı by ile gider
- 2.8 " " " κ_2 ile gider
- 3.12 " " $1/2 \times P_{12}$ by " "
- 4.11 " " $1/2 \times P_{11}$ κ_2 ile gider
- 5.9 " " Paralaksayı bz " "
- 6.4 " " ω_2 ile fazla ω aşırmasını
($\ddot{U}_2 \times P_4$) ver.

- Düzeltme vermeden önceki $\Omega =$ değerini oku = 99.874^g olsun
- ω_2 ile paralaksayı gider yeni değerini kaydet = 99.854^g
- Yenisi ile eskisi arasındaki farkı bul

$$(\text{Yeni}) - (\text{Eski}) = -0.020^g$$

- \ddot{U}_2 katsayısını hesapla 3,2

$$3.2 \times (-0.020^g) = -0.064^g$$

- Son ω değerinden bu farkı çıkarıp sonucu ω tamburuna bağla = 99.790^g

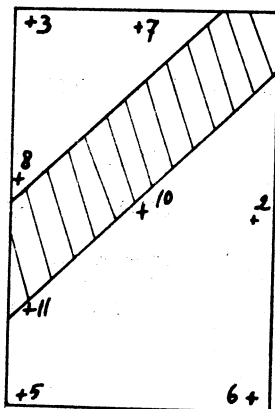
7. 9 Nolu noktada paralaksayı by ile gider.

8. 3 Nolu " " 2 ile gider

$$\text{NOT: } \ddot{U}_2 = \frac{4 \times c^2}{3 \times d^2} + 0.33$$

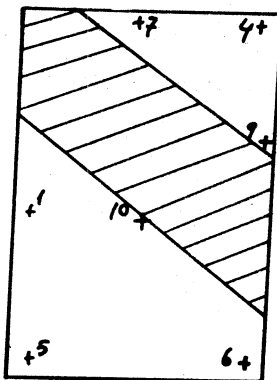
Aşağıda sık sık karşılaştığımız yarım model örneklerini çözümleriyle görelim. Bilhassa Fotogrametri kıymetlendirme operatörlerine aletlerin performans ve kalibrasyonlarına bağlı kalarak da olsa karşılıklı yöneltmede nümerik ve empirik çözümden sürat ve kolaylık getirecektir kanısındayım.

1.



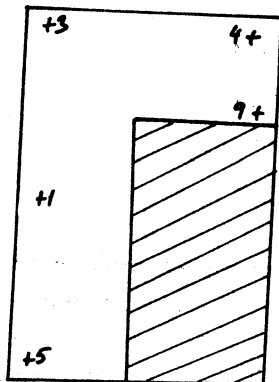
- P_2 κ_1
- P_8 κ_2
- $1/2 \times P_{11}$ κ_2
- P_6 B_z
- P_5 ϕ_2
- $\dot{U}_1 \times P_7$ ω_2
- P_{10} B_y
- P_6 B_z

2.



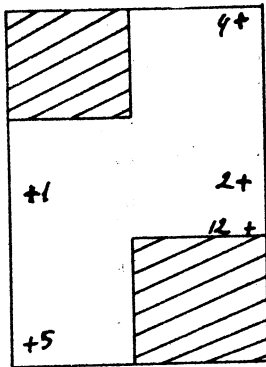
- P_9 B_y
- $1/2 \times P_{12}$ B_y
- P_1 κ_2
- P_6 b_z
- P_5 ϕ_2
- $\dot{U}_1 \times P_7$ ω_2
- P_{10} B_y
- P_6 B_z

3.



- P_1 κ_2
- P_5 ϕ_2
- $\dot{U}_1 \times P_3$ ω_1
- P_1 κ_2
- P_5 ϕ_2
- P_9 B_y
- $2 \times P_4$ B_z
- P_9 B_y
- P_1 κ_2
- P_3 ϕ_2

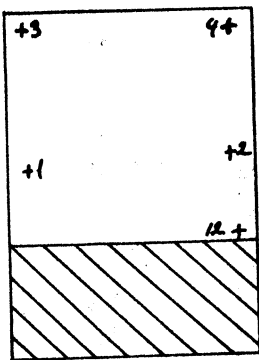
4.



P_2
 P_1
 P_{12}
 $\ddot{U}_3 \times P_4$
 P_2
 P_4
 P_5

B_y
 κ_2
 B_z
 ω_2
 B_y
 B_z
 ϕ_2

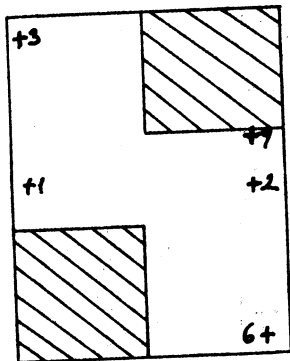
5.



P_2
 P_1
 P_{12}
 $\ddot{U}_3 \times P_4$
 P_2
 P_4
 P_3

B_y
 κ_2
 B_z
 ω_2
 B_y
 B_z
 ϕ_2

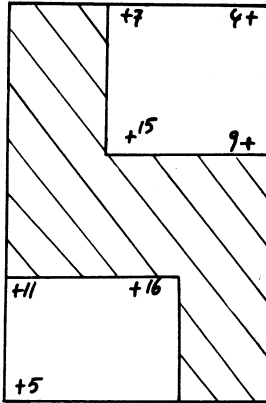
6.



P_2
 P_1
 P_9
 $\ddot{U}_3 \times P_6$
 P_2
 P_6
 P_3

B_y
 κ_2
 B_z
 ω_2
 B_y
 B_z
 ϕ_2

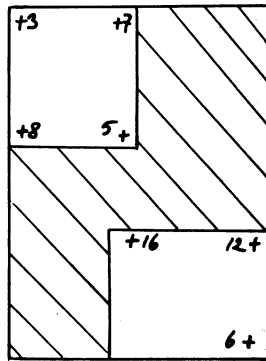
7.



- P_{15}
- $1/2 \times P_{16}$
- P_{15}
- $U_2 \times P_7$
- P_9
- $2 \times P_4$
- P_9
- P_{11}
- $2 \times P_5$
- P_{11}

- B_y
- B_y
- B_z
- ω_2
- B_y
- B_z
- B_y
- κ_2
- ϕ_2
- κ_2

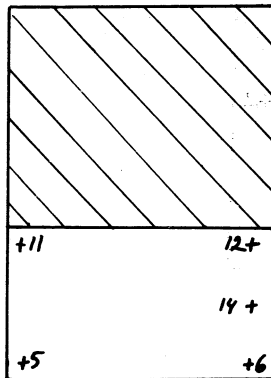
8.



- P_{15}
- $1/2 \times P_{16}$
- P_{15}
- $U_2 \times P_7$
- P_{12}
- P_6
- P_{12}
- P_8
- $2 \times P_3$
- P_8

- B_y
- B_y
- B_z
- ω_2
- B_y
- B_z
- B_y
- κ_2
- ϕ_2
- κ_2

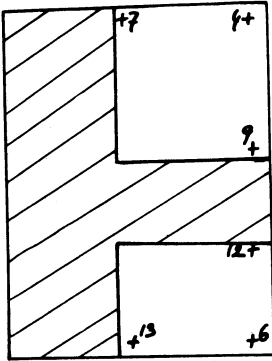
9.



- P_{12}
- $3 \times P_{14}$
- P_{12}
- $U_5 \times P_6$
- P_{12}
- $2 \times P_6$
- P_{11}
- $2 \times P_5$
- P_{11}

- B_y
- B_z
- B_y
- ω_2
- B_y
- B_z
- κ_2
- ϕ_2
- r_2

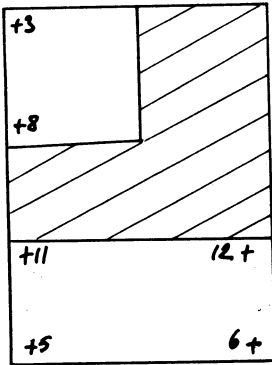
10.



$$\begin{aligned}
 &P_9 \\
 &1/2x P_{12} \\
 &P_9 \\
 &\ddot{U}_2 \times P_4 \\
 &P_9 \\
 &P_7 \\
 &1/2 \times P_{13} \\
 &1/2 \times P_{13} \\
 &P_4 \\
 &1/2 \times P_6 \\
 &2x 1/2x P_6 \\
 &P_4 \\
 &P_7 \\
 &2x P_4 \\
 &P_7
 \end{aligned}$$

$$\begin{aligned}
 &B_y \\
 &B_y \\
 &B_z \\
 &\omega_2 \\
 &B_y \\
 &\kappa_1 \\
 &\kappa_1 \\
 &B_z \\
 &\kappa_1 \\
 &\kappa_1 \\
 &\phi_1 \\
 &B_z \\
 &B_y \\
 &\kappa_1 \\
 &B_y
 \end{aligned}$$

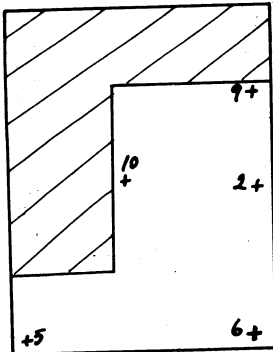
11.



$$\begin{aligned}
 &P_8 \\
 &1/2x P_{11} \\
 &P_8 \\
 &\ddot{U}_2 \times P_3 \\
 &P_8 \\
 &P_{12} \\
 &2 \times P_6 \\
 &P_{12} \\
 &2 \times P_5 \\
 &P_5
 \end{aligned}$$

$$\begin{aligned}
 &\kappa_2 \\
 &\kappa_2 \\
 &\phi_2 \\
 &\omega_1 \\
 &\kappa_2 \\
 &B_y \\
 &B_z \\
 &B_y \\
 &\phi_2 \\
 &\kappa_2
 \end{aligned}$$

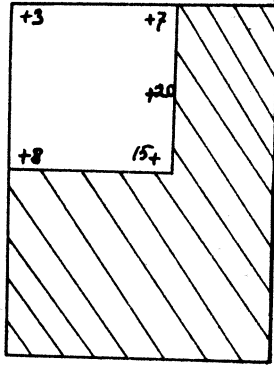
12.



$$\begin{aligned}
 &P_2 \\
 &P_{10} \\
 &P_9 \\
 &\ddot{U}_3 \times P_6 \\
 &P_2 \\
 &P_6 \\
 &P_5
 \end{aligned}$$

$$\begin{aligned}
 &B_y \\
 &\kappa_2 \\
 &B_z \\
 &\omega_2 \\
 &B_y \\
 &B_z \\
 &\phi_2
 \end{aligned}$$

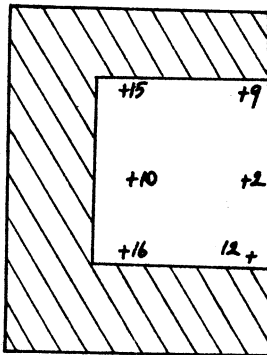
13.



P_{15}
 $2 \times P_{20}$
 P_{15}
 $\ddot{U}_5 \times P_7$
 P_{15}
 $2 \times P_7$
 P_{15}
 $2 \times P_8$
 P_{15}
 $4 \times P_3$
 P_{15}
 $2 \times P_7$
 P_{15}
 $2 \times P_8$
 P_{15}

B_y
 B_z
 B_y
 ω_2
 B_y
 B_z
 B_y
 κ_2
 B_y
 ϕ_2
 B_y
 B_z
 B_y
 κ_2
 B_y

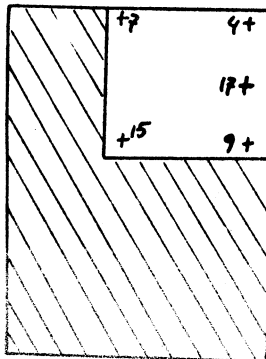
14.



P_2
 P_{10}
 P_9
 $\ddot{U}_7 \times P_{12}$
 P_2
 P_9
 P_{15}
 $1/2 \times P_{16}$
 $1/2 \times P_{16}$

B_y
 κ_2
 B_z
 ω_2
 B_y
 B_z
 ϕ_2
 ϕ_2
 κ_2

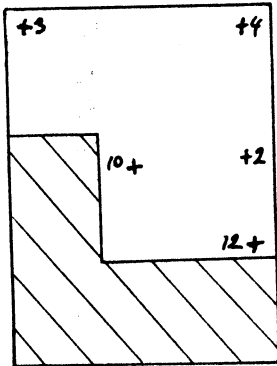
15.



P_9
 $2 \times P_{17}$
 P_9
 $\ddot{U}_5 \times P_4$
 P_9
 $2 \times P_4$
 P_{15}
 $2 \times P_7$
 P_{15}

B_y
 B_z
 B_y
 ω_2
 B_y
 B_z
 κ_2
 ϕ_2
 κ_2

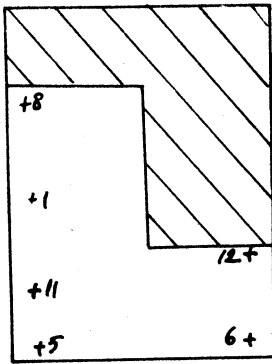
16.



$\ddot{U}_3 \times$
 P_2
 P_{10}
 P_{12}
 P_4
 P_2
 P_4
 P_3
 $2 \times P_3$
 P_8

B_y
 κ_2
 B_z
 ω_2
 B_y
 B_z
 κ_2
 ϕ_2
 κ_2

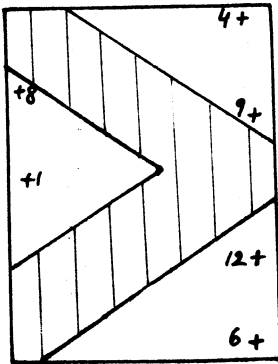
17.



$\ddot{U}_3 \times$
 P_1
 P_8
 P_5
 P_1
 P_5
 P_{12}
 $2 \times P_6$
 P_{12}
 P_{11}
 $2 \times P_5$
 P_1

κ_2
 ϕ_2
 ω_1
 κ_2
 ϕ_2
 B_y
 B_z
 B_y
 κ_2
 ϕ_2
 κ_2

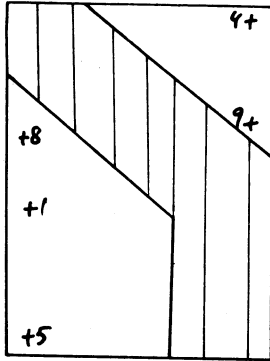
18.



$\ddot{U}_2 \times$
 P_9
 $1/2 \times P_{12}$
 P_9
 P_4
 P_{12}
 P_1
 P_8

B_y
 B_y
 B_z
 ω_2
 B_y
 κ_2
 ϕ_2

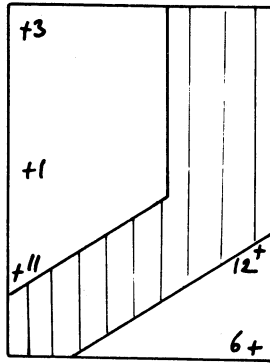
19.



\ddot{U}_3^x P_1
 P_8
 P_5
 P_1
 P_5
 P_9
 $2 \times P_4$
 P_9
 P_1
 P_5

κ_2
 ϕ_2
 ω_1
 κ_2
 ϕ_2
 B_y
 B_z
 B_y
 κ_2
 ϕ_2

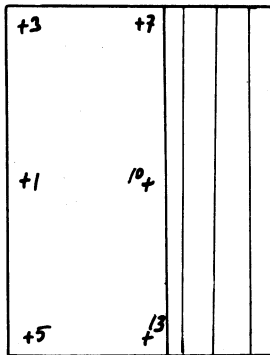
20.



\ddot{U}_3^x P_1
 P_{11}
 P_3
 P_1
 P_3
 P_{12}
 $2 \times P_6$
 P_{12}
 P_1
 P_3

κ_2
 ϕ_2
 ω_1
 κ_2
 ϕ_2
 B_y
 B_z
 B_y
 κ_2
 ϕ_2

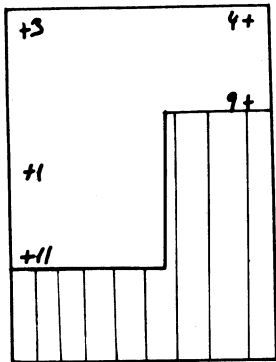
21.



$2 \times P_{10}$
 P_1
 P_{10}
 P_{13}
 \ddot{U}_1^x P_7
 P_{10}
 P_{13}
 $2 \times P_5$
 P_{13}

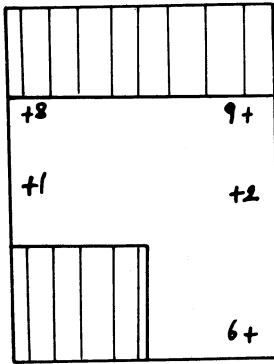
B_y
 κ_2
 B_y
 B_z
 ω_2
 B_y
 B_z
 ϕ_2
 B_z

22.



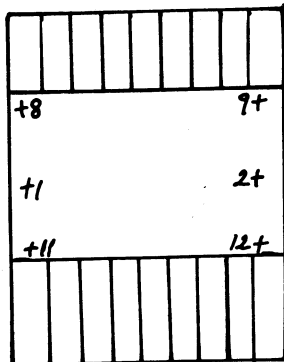
- P_1
 - P_{11}
 - $\ddot{U}_3 \times P_3$
 - P_1
 - P_5
 - P_9
 - $2 \times P_4$
 - P_9
 - P_1
 - P_3
- κ_2
 - ϕ_2
 - ω_1
 - κ_2
 - ϕ_2
 - B_y
 - B_z
 - B_y
 - κ_2
 - ϕ_2

23.



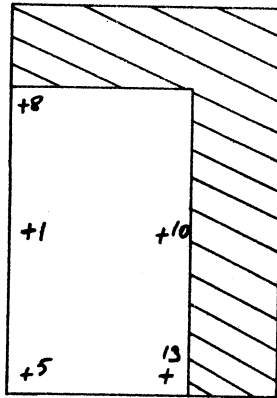
- P_2
 - P_1
 - P_9
 - $\ddot{U}_3 \times P_6$
 - P_2
 - P_6
 - P_8
- B_y
 - κ_2
 - B_z
 - ω_2
 - B_y
 - B_z
 - ϕ_2

24.



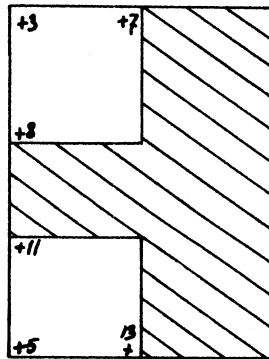
- P_2
 - P_1
 - P_9
 - $\ddot{U}_6 \times P_{12}$
 - P_8
 - $1/2 \times P_{11}$
 - $1/2 \times P_{11}$
- B_y
 - κ_2
 - B_z
 - ω_2
 - ϕ_2
 - ϕ_2
 - κ_2

25.



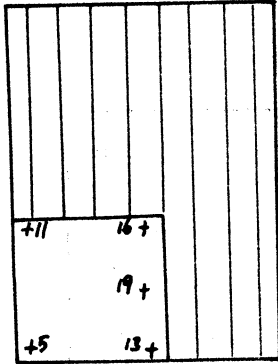
- | | | |
|---------------------|----------|------------|
| | P_1 | κ_2 |
| | P_8 | ϕ_2 |
| $\ddot{U}_3 \times$ | P_5 | ω_2 |
| | P_1 | κ_2 |
| | P_5 | ϕ_2 |
| | P_{10} | B_y |
| $2 \times$ | P_1 | κ_2 |
| | P_{10} | B_y |
| | P_{13} | B_z |
| $2 \times$ | P_5 | ϕ_2 |
| | P_{13} | B_z |

26.



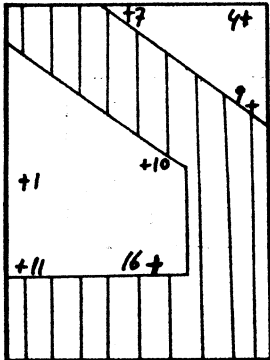
- | | | |
|-----------------------|------------------|------------|
| | P_7 | κ_2 |
| $1/2 \times \times$ | P_{13} | κ_2 |
| $1/2 \times$ | P_{13} | B_z |
| | P_3 | κ_2 |
| | $1/2 \times P_5$ | κ_2 |
| $2 \times 1/2 \times$ | P_5 | ϕ_2 |
| | P_3 | B_z |
| | P_7 | B_y |
| $2 \times$ | P_3 | κ_2 |
| | P_7 | B_y |

27.



- P_{16} B_y
- $2 \times P_{19}$ B_z
- P_{16} B_y
- $\ddot{U}_5 \times P_{13}$ ω_2
- P_{16} B_y
- $2 \times P_{13}$ B_z
- P_{16} B_y
- $2 \times P_{11}$ κ_2
- P_{16} B_y
- $4 \times P_5$ ϕ_2
- P_{16} B_y
- $2 \times P_{13}$ B_z
- P_{16} B_y
- $2 \times P_{11}$ κ_2
- P_{16} B_y

28.



- P_{10} B_y
- $2 \times P_1$ κ_2
- P_{10} B_y
- P_{16} B_z
- $\ddot{U}_3 \times P_7$ ω_2
- P_9 B_y
- $2 \times P_4$ B_z
- P_9 B_y
- P_1 κ_2
- P_{11} ϕ_2

FAZLA OMEGA AŞIRTMA FORMÜLLERİ

$$\ddot{u}_1 = 0,5 \left(\frac{c^2}{d^2} - 1 \right)$$

d \ c	100 mm	90 mm
88 mm	-0.1	0.0
152 mm	0.6	0.9
210 mm	1.7	2.2
305 mm	4.2	5.2

$$\ddot{u}_2 = \frac{4xc^2}{3xd^2} + 0.33$$

d \ c	100 mm	90 mm
88 mm	1.4	1.6
152 mm	3.4	4.1
210 mm	6.2	7.6
305 mm	12.7	15.6

$$\ddot{U}_3 = \frac{2xc^2}{3xd^2} - 0.33$$

d \ c	100 mm	90 mm
88 mm	0.2	0.3
152 mm	1.2	1.6
210 mm	2.6	3.3
305 mm	5.9	7.3

$$\ddot{U}_4 = \frac{2xc^2}{d^2} + 1$$

d \ c	100 mm	90 mm
88 mm	2.5	2.9
152 mm	5.6	6.7
210 mm	9.8	11.9
305 mm	19.6	24.0

$$\ddot{U}_5 = \frac{8xc^2}{d^2}$$

d \ c	100 mm	90 mm
88 mm	6.2	7.6
152 mm	18.5	22.8
210 mm	35.3	43.6
305 mm	74.4	91.9

$$\ddot{u}_6 = \frac{2xc^2}{d^2} - 0.5$$

d \ c	100 mm	90 mm	60 mm	50 mm	40 mm
88 mm	1.0	1.4	3.8	5.7	9.2
152 mm	4.1	5.2	12.3	18.0	28.4
210 mm	8.3	10.4	24.0	34.8	54.6
305 mm	18.1	22.5	51.5	73.9	115.9

$$\ddot{u}_7 = 0.5 \times \frac{c^2}{d^2} - 0.5$$

d \ c	60 mm	50 mm	40 mm
88 mm	0.6	1.0	1.9
152 mm	2.7	4.1	6.7
210 mm	5.6	8.3	13.3
305 mm	12.4	18.1	28.6

KAYNAKÇA :

Applikationsinformation Photogrammetrische Geräte

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