

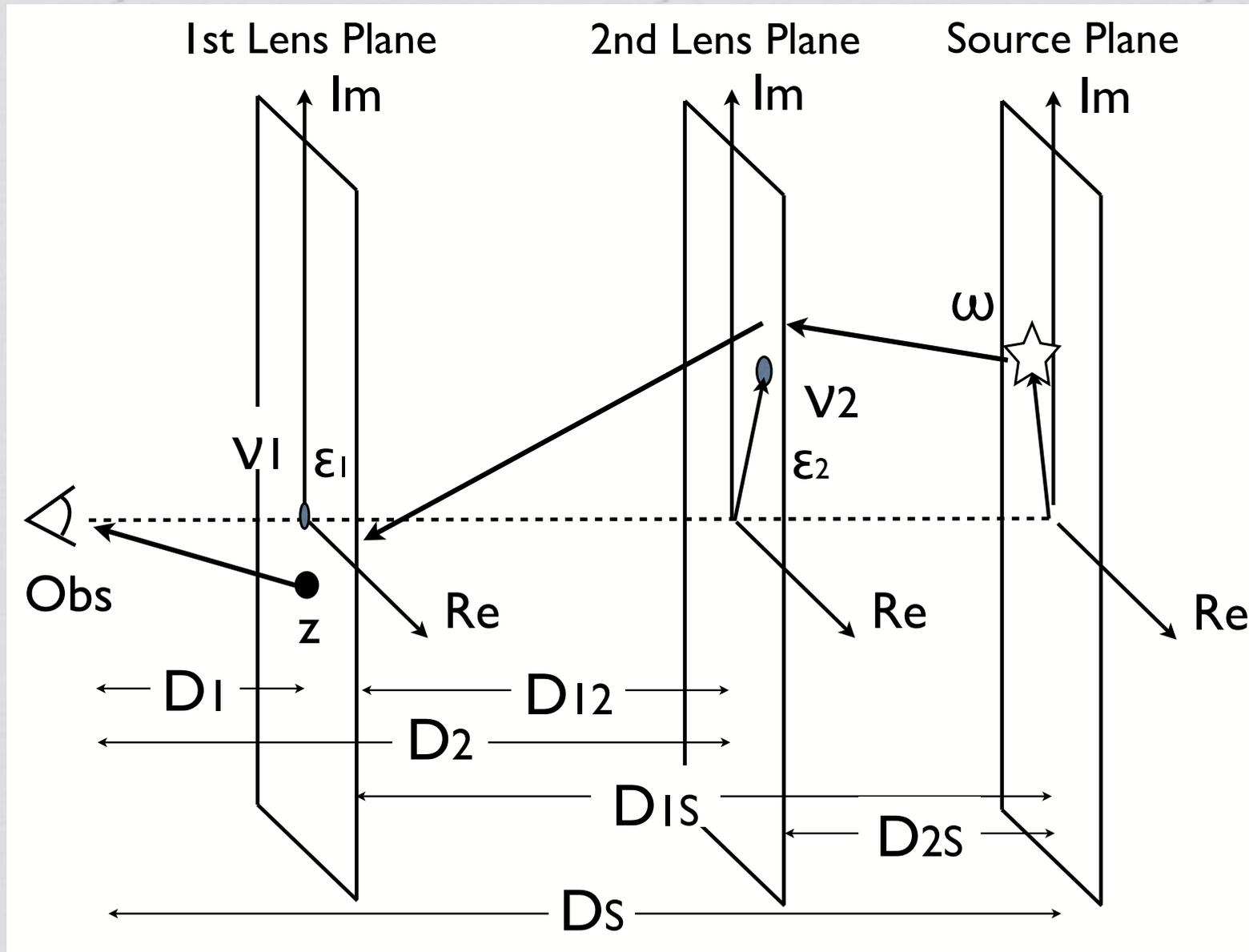
Perturbative solutions

to the lens equation
for multiple lens planes

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The Gravitational lensing for multiple lens planes



Two lens planes

$$w = z - \left\{ \frac{1 - \nu}{z^*} + \nu D_2 \left(\frac{A}{z^* - z_+} + \frac{B}{z^* - z_-} \right) \right\}$$

Excellent!!

order \	1	2	3	4
'full' order	2.410339	-0.411673	1.339816	-0.338482
first order	2.410895	-0.468038	1.340365	-0.340365
second order	2.410323	-0.418700	1.339832	-0.337857
third order	2.410014	-0.412183	1.339821	-0.338904

N point mass

$$w = z - \sum_i^N \frac{\nu_i D_i}{\alpha_i}$$

where

$$z = \sum_{p_2=0}^{\infty} \sum_{p_3=0}^{\infty} \cdots \sum_{p_{2N}=0}^{\infty} (\nu_2)^{p_2} (\nu_3)^{p_3} \cdots (\nu_{2N})^{p_{2N}} z_{(p_2)(p_3)\cdots(p_{2N})}$$

$$\alpha_i = z^* - \epsilon^* - \sum_j^{i-1} \frac{\nu_j d_j}{\alpha_j}, \quad D_i = \frac{D_1(D_S - D_i)}{D_i(D_S - D_1)}, \quad d_j = \frac{D_1(D_i - D_j)}{D_i D_j (D_S - D_1)}$$

Conclusion

We obtain *perturbative solutions* for multiple lens planes

- $N=2$
- $N=\text{Arbitrary}$

Future works :Applications to Observation

Please visit my poster.(No.20)

Thank you for your attention!!
