

Face Recognition Using Light Field Camera: A Preliminary Study

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- Introduction: Light-field Camera (LFC)
- Face recognition using Lytro (LFC)
- Preliminary Results
- Discussion

Light-field or Plenoptic or Directional camera



GSKO

20 <u>12</u>	Consumer plenoptic camera Lytro Inc.
20 <u>11</u>	Commercial plenoptic camera Raytrix
20 <u>05</u>	Hand held plenoptic camera Ren Ng
19 <u>92</u>	Single lens plenoptic camera Adelson and Bergen
19 <u>30</u>	Lenticular lens: Parallax Ives
19 <u>08</u>	Integral camera
16 <u>00</u>	Radiant pyramids Leonardo Da vinci



Plenoptic function



What set of all things one can see

Figure credit: Leonard McMillan, Introduction to plenoptic camera, Siggraph 2012.



Ρ(θ, φ)

- Intensity of light:
- Single view point.
- Averaged over wavelength \rightarrow Gray Image.



$P(\theta, \phi, \lambda)$

- From single point of view.
- Function of wavelength.
- Colour image.



 $P(\theta, \phi, \lambda, t)$

• Time — Movie

Figure credit: Leonard McMillan, Introduction to plenoptic camera, Siggraph 2012.



$P(\theta, \phi, \lambda, t, Vx, Vy, Vz)$

• All possible view — Holographic movie





Light-field Rendering

• There are three ways: Micro lens array\ Pinhole array\ Masks (s,t)





Light-field Rendering Contd...,

• Two steps:





Levoy, M. & Hanrahan, P.; Light field rendering, *Proceedings of the 23rd annual conference on Computer graphics and interactive techniques*, **1996**, 31-42



Light-field Rendering Contd...,





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Features of Light-field camera

- Multiple focus images in one shot.
- No need to adjust the lens to set focus.
- Real-time exposure
- Portable and hand-held



Advantages over Conventional Camera

- Refocusing.
- All-in-focus.
- Depth estimation.
- Synthetic aperture.

Available Light-field cameras



- First consumer LFC.
- 11 Mega Rays, 1.2MP spatial resolution.
- 1,00,000 micro-lenses focused at infinity.
- Main lens is focused at f/4.
- Low cost and user friendly.
- First industrial quality model.
- 11 Mega Rays, 2.7MP spatial resolution.
- 20,000 micro-lenses, each focused at differently.
- Video rendering at 6 frames/sec.
- High in cost and more computational.





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