



Star-seeker

寻星者

Star Seeker

GROUP 2 SXJ CYP CJY YFY

Astronomical

INSPIRATION

从此，你将与历史上众多灿若星辰的名字一起，共享‘浙大人’这个无上荣光的称号！

--浙大录取通知



STAR SEEKER | GROUP2

SURVEY & STORYBOARD

Two main problems &
Solutions



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Astronomical

SURVEY

PAINPOINT

For astrophiles, it is rather difficult to quickly identify the name or get information of the stars in sight.

To determine the name of the target star, they usually use starmap apps, such as star walk2 and Stellarium, to simulate their viewpoint. However, the apps interfere with the experience of stargazing, because they distract astrophiles' attention and harm their eyesight at night.

采访记录：

对象：摄影师刘同学

得到的信息：

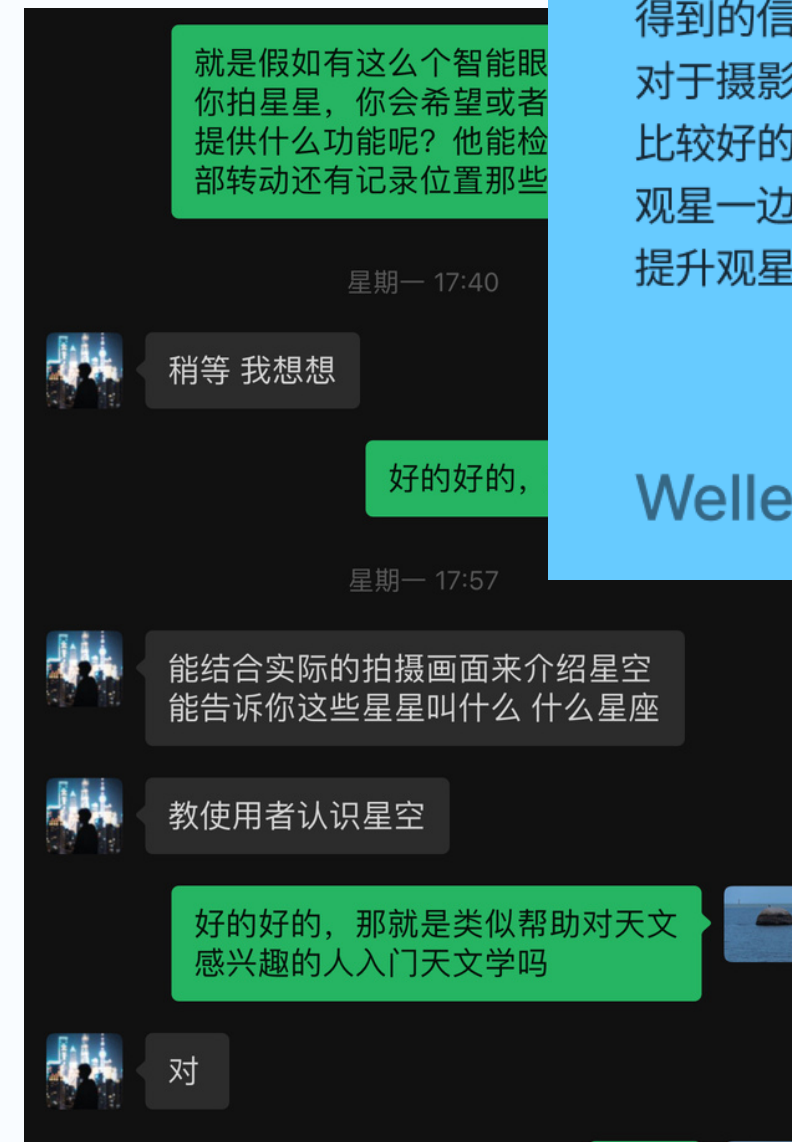
摄影师需要了解天气、位置等，而对单个星星的识别一般没有特别的需要（往往是星空的拍摄，对天文学知识相对比较缺乏）

对象：浙大天文协会会长

得到的信息：

对于摄影师可能作用不是特别大，但是对于观星者来说是比较好的，因为在观星的时候眼睛需要适应黑暗，而一边观星一边看手机造成的体验不好，如果是语音提示会有效提升观星体验。

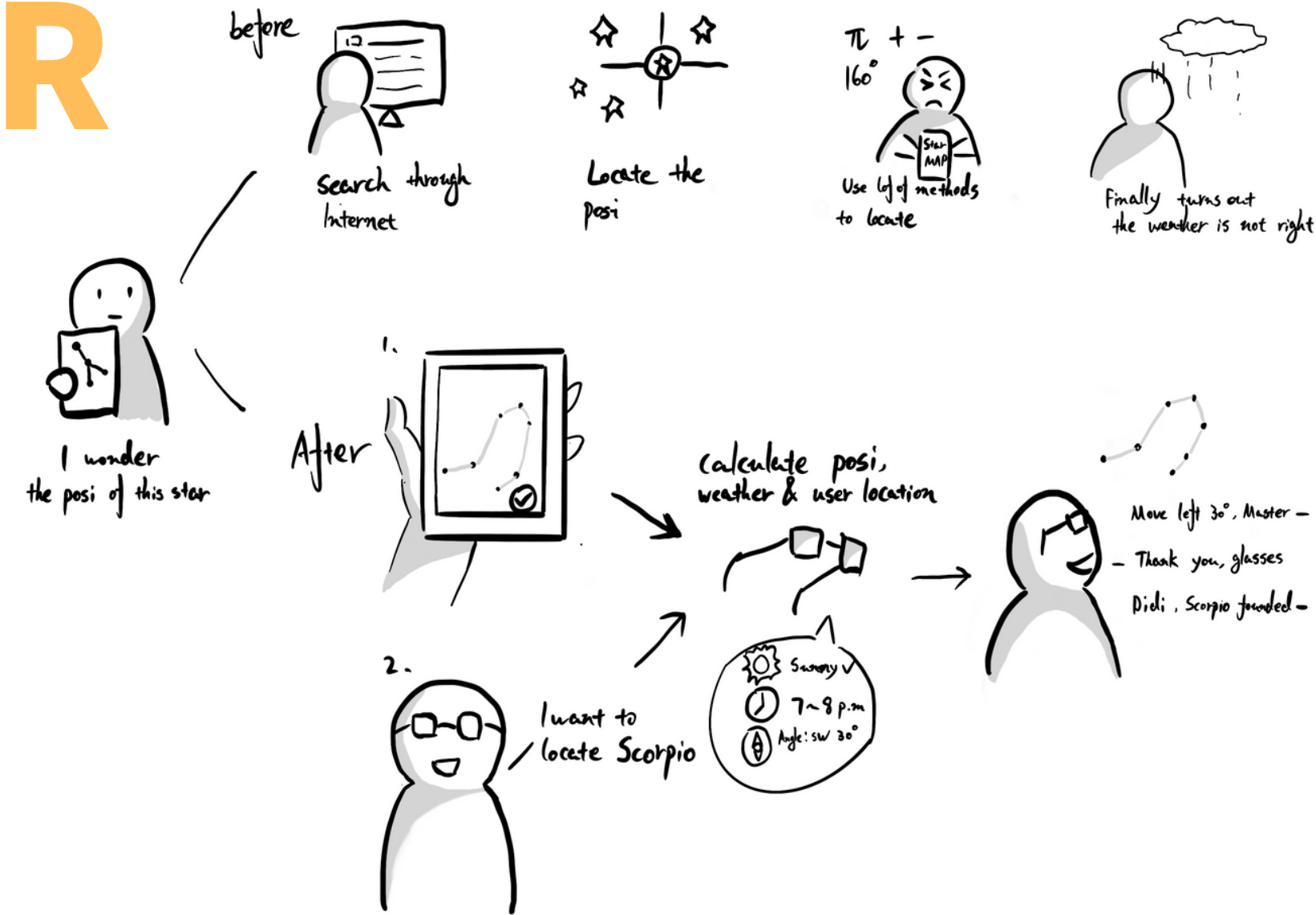
Welles Sun



Astronomical

FIND THE STAR &

LEARN THE STAR

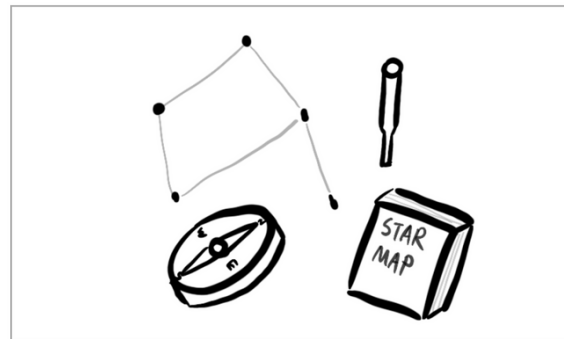


Before



When people see a star, they don't know their info

Scenario Name



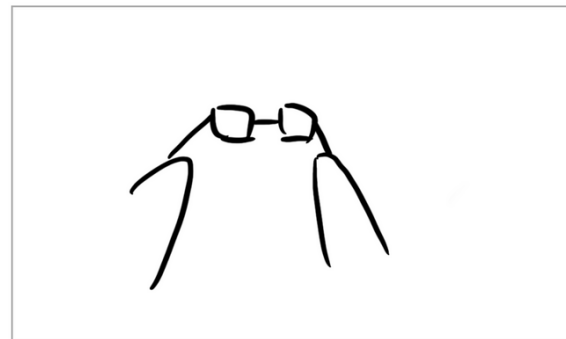
In order to get the info, they will need to use many methods like compass or star map to learn what are they.

Metadata

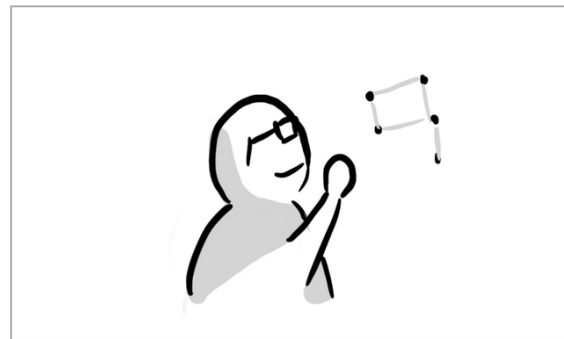


Therefore even some people have interests in Astronomy. The difficulty to learn it will stop them from this activity.

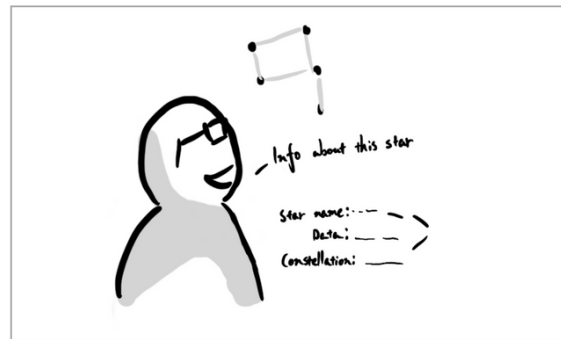
After



Now with the help of Huawei glasses



They can easily locate and learn the info about the stars



By simply ask the glasses, the glasses will then proceed the info and help user learn about it.

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Main

HOW TO FIND A STAR?

Two main problems &
Solutions



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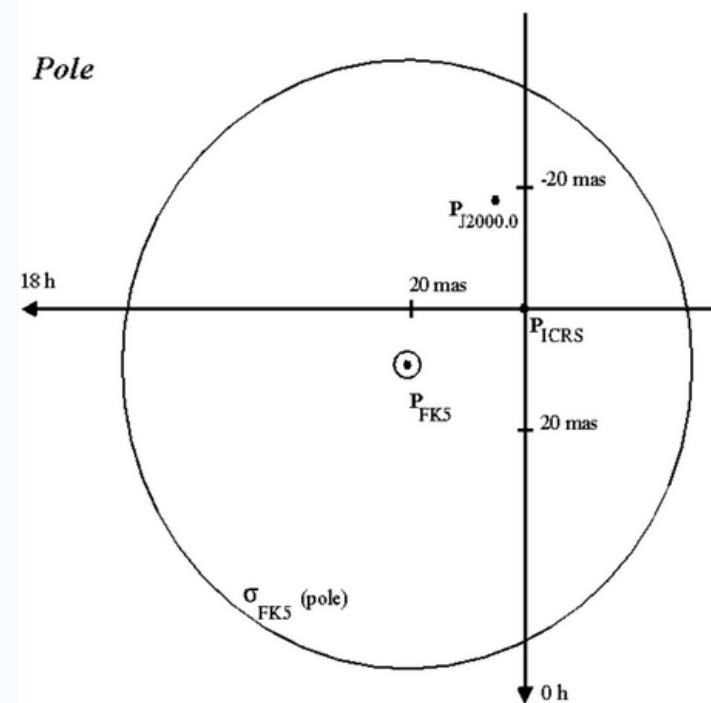
WHERE IS THE STAR?

Calculations

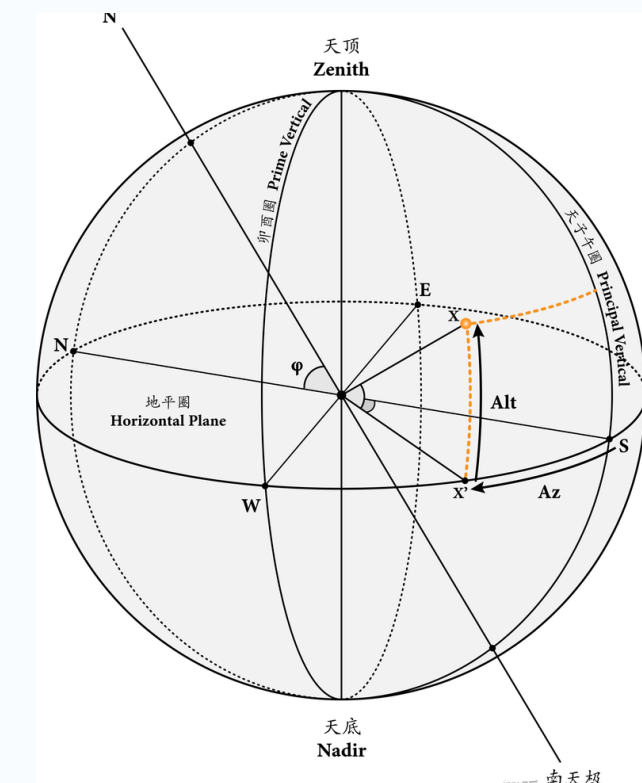


中国科学院
国家天文台

A series of coordinate system transformations



latitude
longitude
time



International **C**elestial **R**eference **S**ystem
Regardless of latitude, longitude and time

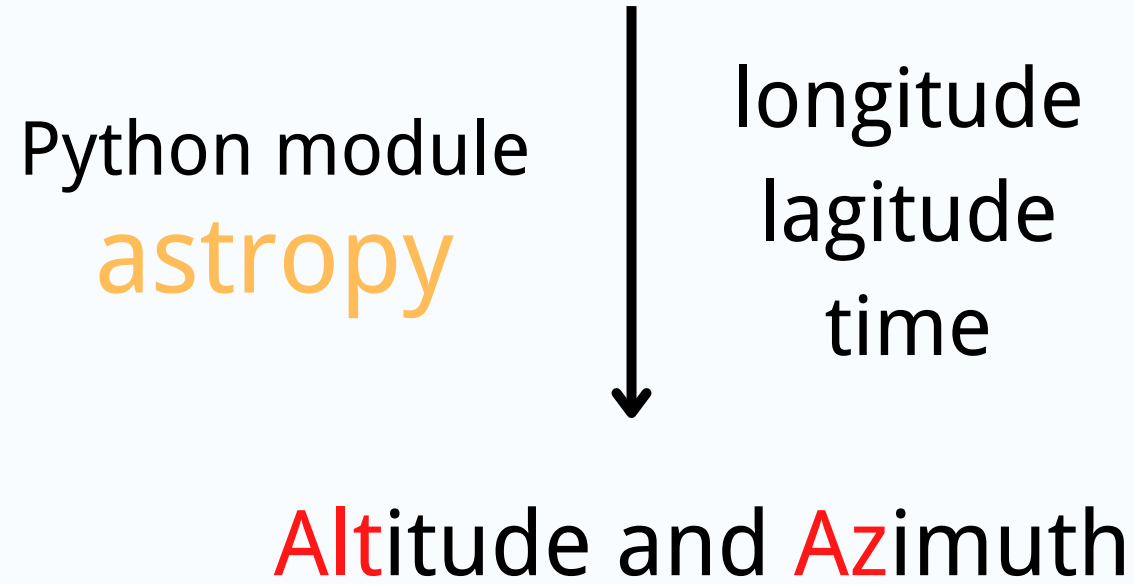
Altitude-**a**zimuth Reference System
Depends on the observer

Talk Is Cheap. CODE Show me the CODE.



Star Seeker
星尋

Get **R**ight **A**scension and **D**ecilination from
Bright **S**tar **C**atalogue



```
def get_ra_and_des(hr_num):
    # read CDS format files
    table = ascii.read("catalog", readme="ReadMe")
    table.add_index('HR')
    row = table.loc[hr_num]
    # select RA and DES
    ret = []
    ret.append(str(row[table.index_column('RAh')]) + 'h' + str(row[table.index_column('RAm')]) + 'm' +
               str(row[table.index_column('RAs')]) + 's')
    ret.append(str(row[table.index_column('DEd')]) + 'd' + str(row[table.index_column('DEm')]) + 'm' +
               str(row[table.index_column('DEs')]) + 's')
    return ret
```

```
def get_skycoord(ra_des, longitude, latitude, height, time):
    observer = EarthLocation(lat=latitude*units.deg, lon=longitude*units.deg, height=height*units.m)
    opt_target = SkyCoord(ra=ra_des[0], dec=ra_des[1], unit=(units.hourangle, units.deg))
    opt_pos = opt_target.transform_to(AltAz(obstime=time, location=observer))
    ret = [opt_pos.alt.deg, opt_pos.az.deg]
    return ret
```

```
def get_opt_altaz(hr_num, longitude, latitude, height, time):
    ra_des = get_ra_and_des(hr_num)
    return get_skycoord(ra_des, longitude, latitude, height, time)
```


WHERE WE'RE LOOKING AT?



University of Seoul

서울대학교

College of Engineering

From Gyroscope and Acceleration sensor to Euler Angle:
Attitude and **H**eading **R**eference **S**ystem algorithm

PROBLEM: Gyroscopes have **low accuracy**

Corrected with accelerometer: **IMU fusion algorithm** [1]

[1] Madgwick, Sebastian. “AHRS algorithms and calibration solutions to facilitate new applications using low-cost MEMS.” (2014).

CODE



Star Seeker

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$${}^S_E q_{\omega,t} = {}^S_E \hat{q}_{est,t-1} + \frac{\Delta t}{2} \left(\frac{1}{2} {}^S_E \hat{q}_{est,t-1} \otimes {}^S \omega_{t-1} + \frac{1}{2} ({}^S_E \hat{q}_{est,t-1} + \Delta t (\frac{1}{2} {}^S_E \hat{q}_{est,t-1} \otimes {}^S \omega_{t-1})) \otimes {}^S \omega_t \right)$$

$${}^S_E \hat{q}_{t,k} = {}^S_E \hat{q}_{t,k-1} + \frac{\nabla f({}^S_E \hat{q}_{t,k}, {}^E \hat{y}, {}^S \hat{y}_t)}{\|\nabla f({}^S_E \hat{q}_{t,k}, {}^E \hat{y}, {}^S \hat{y}_t)\|} \mu_t, k = 1, 2, \dots, n$$

$$\begin{aligned} {}^S_E q_{est,t} &= \alpha_1 {}^S_E q_{\omega,t} + \alpha_2 {}^S_E q_{\nabla,t} \\ \alpha_1 + \alpha_2 &= 1, 0 \leq \alpha_1 \leq 1, 0 \leq \alpha_2 \leq 1 \end{aligned}$$

$$\alpha_1 = 1 - \frac{\beta \Delta_t}{\beta \Delta_t + \mu_t}$$

$$\alpha_2 = 1 - \frac{\mu_t}{\beta \Delta_t + \mu_t}$$

```
import imufusion
ahrs=imufusion.Ahrs()
ahrs.update_no_magnetometer(gyro[i, : ], acc[i, : ], 1 / 250)
```

Talk Is Cheap. **CODE** Show me the CODE.



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The return value of the function is **Quaternions**.....

From Quaternions to Euler Angle

$$\begin{bmatrix} Roll \\ Pitch \\ Yaw \end{bmatrix} = \begin{bmatrix} \arctan \frac{2(q_0 q_1 + q_2 q_3)}{1 - 2(q_1^2 + q_2^2)} \\ \arcsin(s(q_0 q_1 - q_3 q_1)) \\ \arctan \frac{2(q_0 q_3 + q_1 q_2)}{1 - 2(q_2^2 + q_3^2)} \end{bmatrix}$$

Finally.....

$$distance = R \cdot arccos(cos\beta_1 cos\beta_2 cos(\alpha_1 - \alpha_2) + sin\beta_1 sin\beta_2)$$

WHAT MAKES STARSEEKER?

STAR SEEKER | GROUP2

The Technology We Apply:
NLP
Cloud Computation
Auto Bluetooth Connection
UI Design



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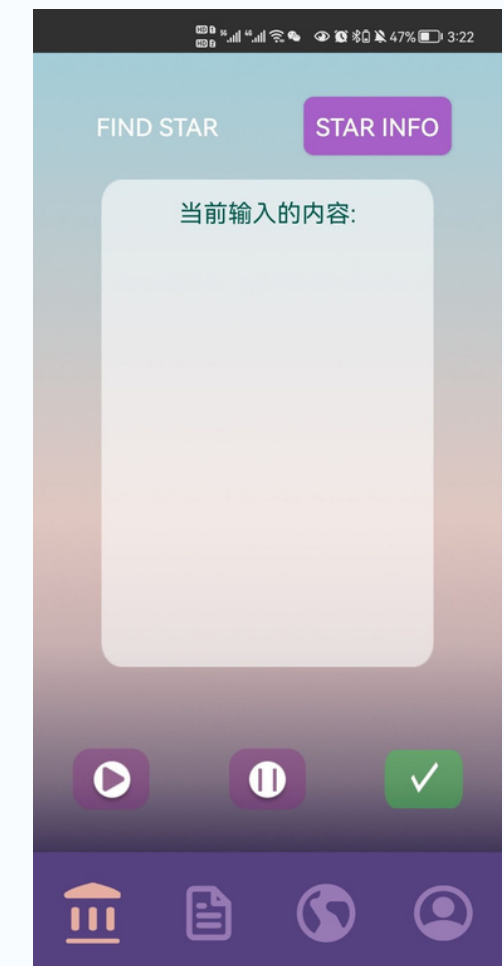
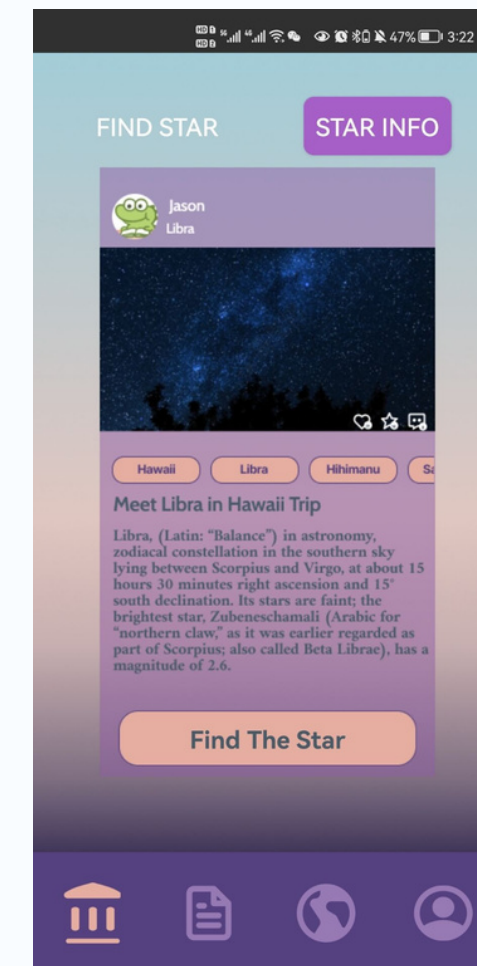
Star Seeker

북두성

Speech Recognition & Voice broadcast

It can help users to search for stars and get relevant information without using their mobile phone, which can facilitate them to focus on observing stars better.

Star NLP Seeker





UNIVERSITY OF SEOUL

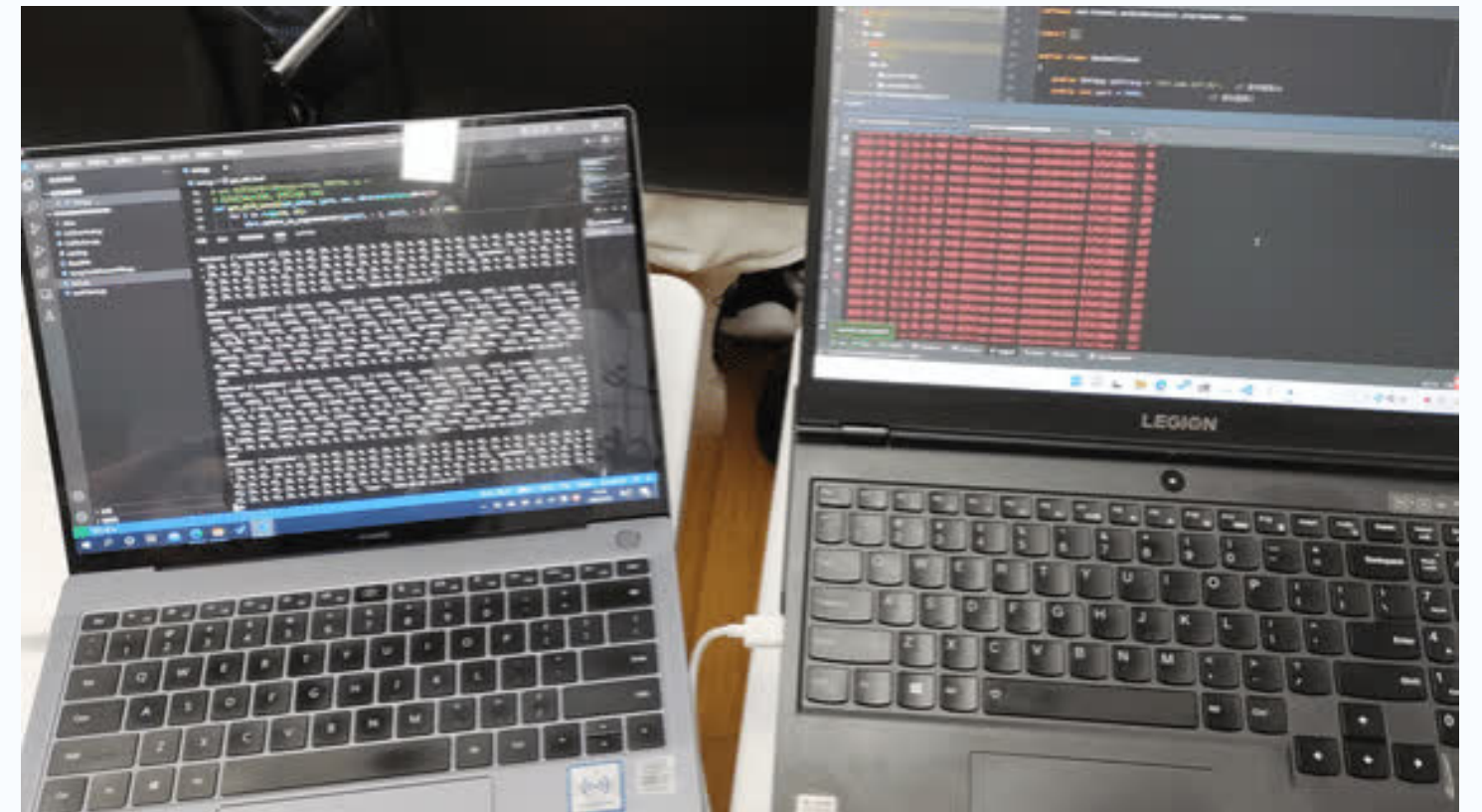
서울대학교

Cloud Computing

Client sends position, gyro and acceleration sensor to cloud server, and after calculating the difference between user's viewpoint and star position, the server sends result back to the client **in real time**.

The difference is ranked from 0 to 255 (smaller means nearer), and the rank is reflected by the **volume** and **sound channel** of glasses.

Cloud Computing





Stargazer

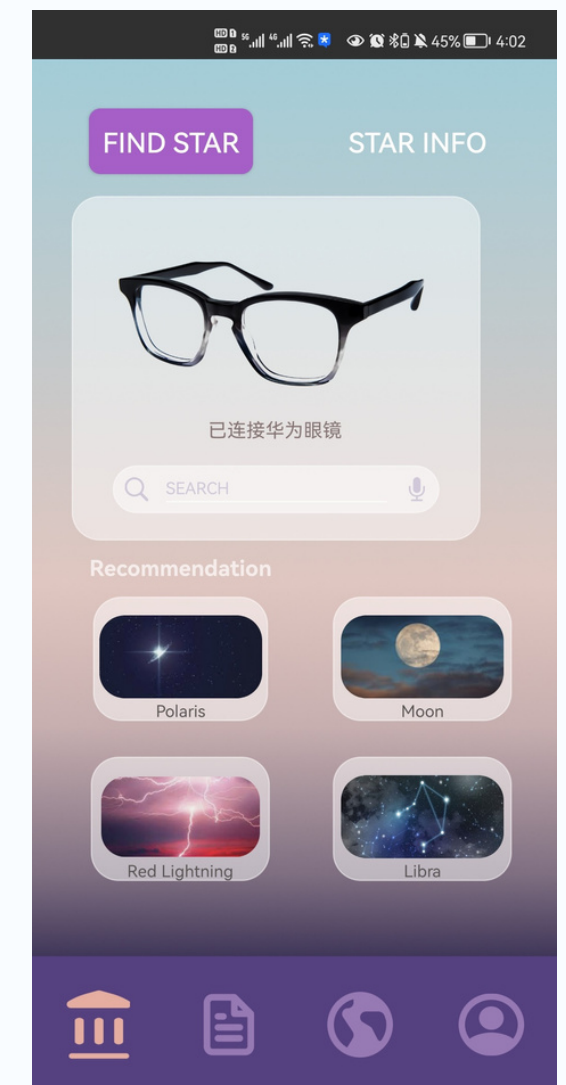
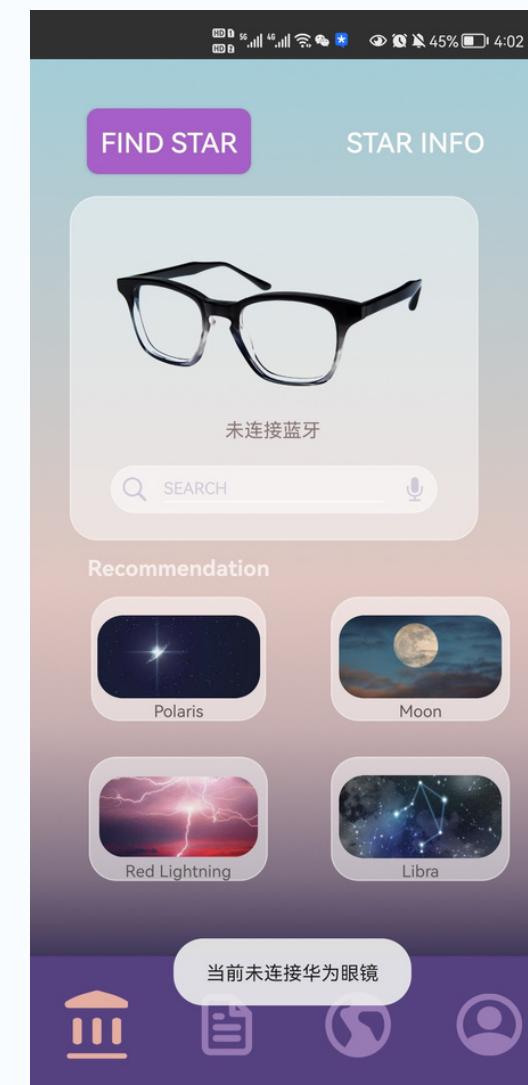
북두

Auto Bluetooth Connection

Huawei Smart Glasses Auto Connection

Auto detect the connection of Huawei Smart Glasses which greatly improves the user experience.

(left: without Huawei Smart Glasses and all operations forbidden, right: with Huawei Smart Glasses)





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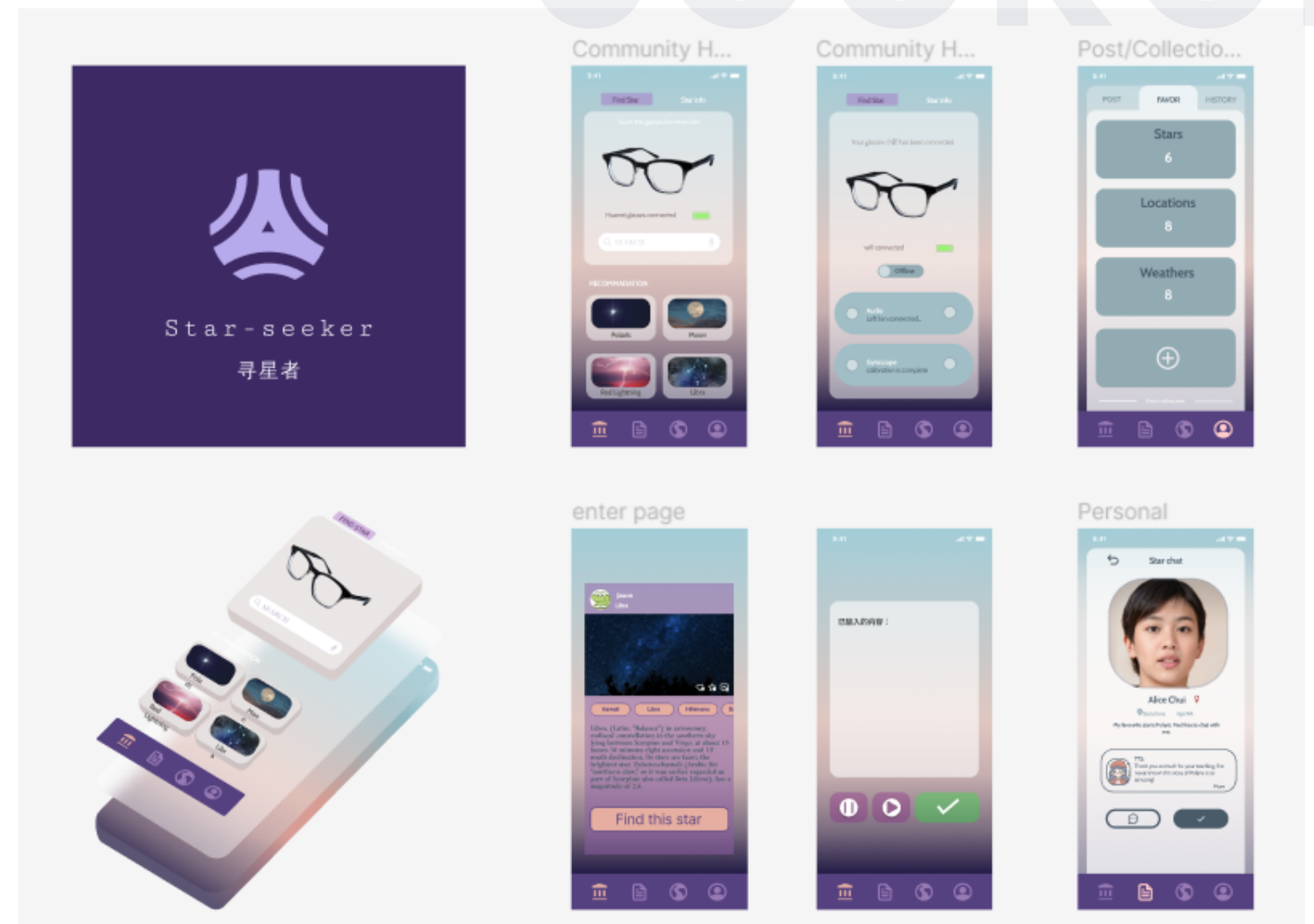
UI & logo Design

Star-seeker

Consistent color schemes

In the ui design, we used the **Morandi** color scheme to create the mysterious and quiet feeling of the starry sky.

For the software interface, we chose to use a **gradient** color background so as to give users a richer visual experience.





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Plan and work

Notion Script Storyboard

Video Design

SCRIPT

-Finally back to the story. I always thought that Stargazing is a magical way to shorten distance and to experience the beauty of our natural world. It is a combination of both sense and sensibility. And I believe everyone can experience something in this activity. Because after all, we are all under the same sky.

-Because as a beginner, even when you use compass and telescope, finding a star can be very difficult.

-Hi twinkle, Please tell me some info about the stars in my area.

-Got it. You are looking at polaris right now. In Norse tale it is the end of a spike around which the sky rotates; in Mongolian legend it is a peg that holds the world together. But overall, humanity has been fascinated by Polaris. Polaris seems to be concerned with the practical side of life.

寻星者脚本

镜头号	景别	镜头运动	时长	内容	备注	音效
(前三十秒入题)						
1	中景	推		3 “你为什么喜欢星星”	白底黑字	
2	特写	推		5 访谈画面 访谈者		
3	中远景	定		5 穿插旅行 星星画面	网上找素材	
4	远景	定		5 拍星星画面。“然后星星很安静，很让人安心”	网上找素材	
5				5 天气状况图片穿插访谈画面“但是刚接触观星的时候遇上各种状况确实也挺痛苦的”	网上找素材	
3				3 “如果回到小白阶段，有副眼镜能帮我观星。我希望它能”	白底黑字	

📘 Add description



Star-seeker 寻星者

📅 Board view 📅 Calendar 📅 Table 📅 Table + Add view

👤 执行人 👤 创建者 + Add filter

已完成 10

挂起 0

+ New

NLP

👤 陈逸鹏

📄 前端设计

👤 Sun Welles

天体计算

👤 anonymifish

📄 实际测试 (wizard of oz)

📄 用户画像Persona

📄 Day1 报告

🕒 Thomas 👤 陈逸鹏 👤 anonymifish

👤 Sun Welles

📄 Day2 报告 Storyboard&交互流程

🕒 Thomas



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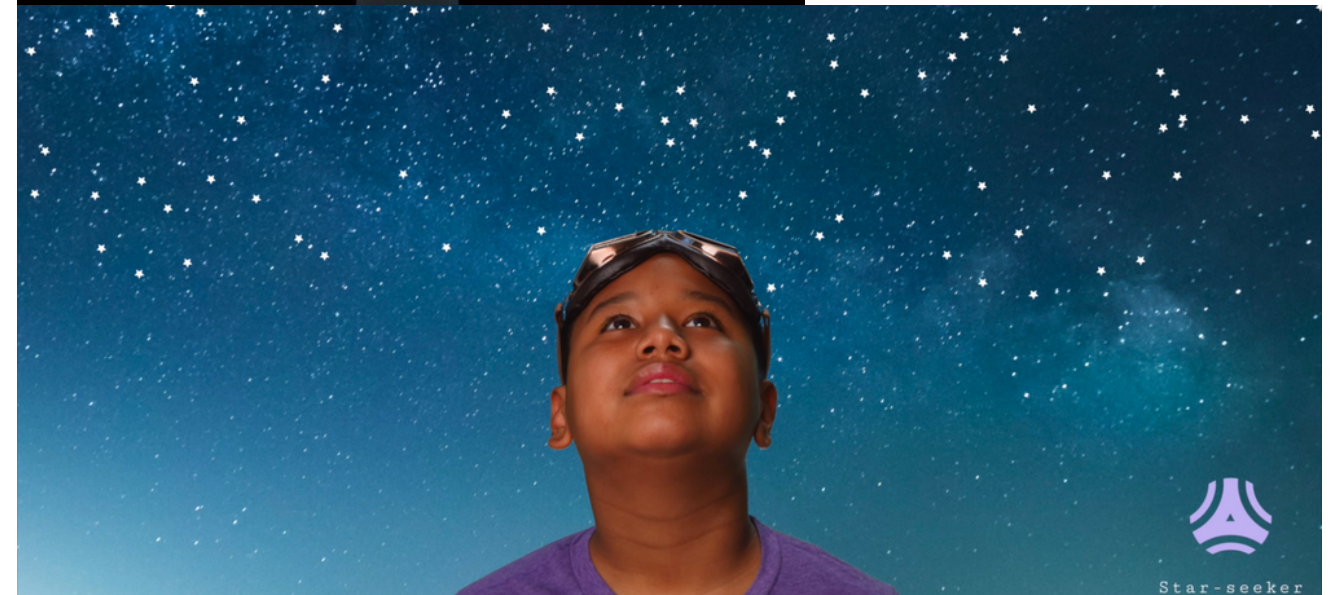
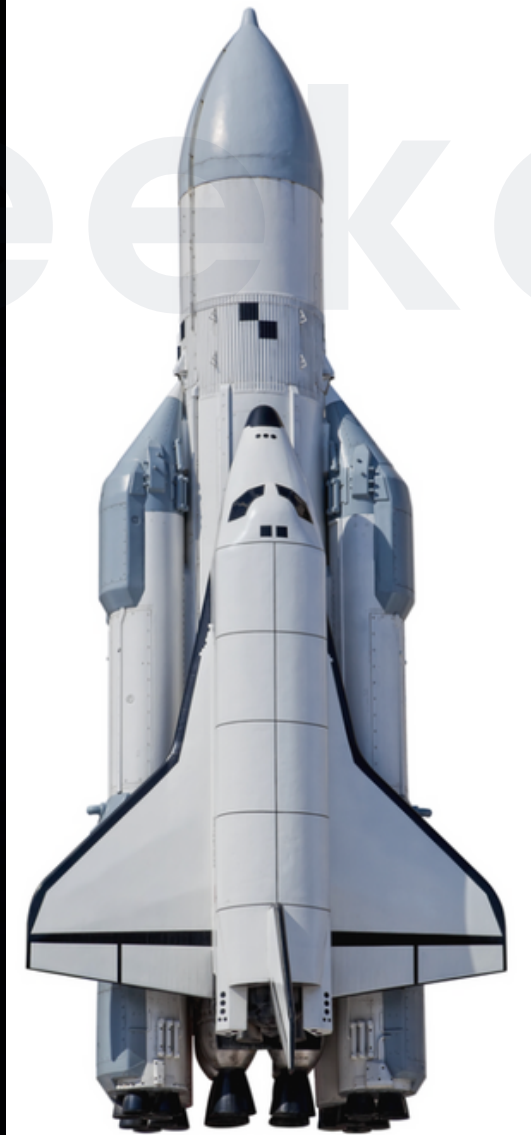
별탐색

From Seeking to Knowing

Mankind's curiosity about the **starry sea** is the reason for our continuous progressing.

We hope that through this feature more people can take some time to appreciate the beautiful sky in the future.

CURIOSITY





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Star THANK YOU Seeker

GROUP 2 SXJ CYP CJY YFY