* Why might the Mars Rover need some autonomy?

1. Situations cannot be fully analyzed and predicted.

Before the launch, the researchers can’t anticipate all the situations the Mars Rover might encounter, like uncrossable terrains, extreme climates, so sufficient autonomy allows it to solve these problems more effectively.

2.Manual control leads to huge costs and inefficiencies.

Due to the length of planetary exploration missions, if the Mars Rover needs to be controlled at any point, the number of expenses and staff could be tremendous. In the meantime, because of signal delay, the task efficiency could be unsatisfactory. An immediate reaction and proactiveness are required in a better exploration.

3.Multiple instruments might be collaborating and goals are changing.

During the exploration of Mars, goals might be expanded and contracted when different situations arise. There also might be multiple instruments exploring together on Mars and sharing the information. Swift reaction and autonomous cooperation are necessary.

* What does the Mars rover need to reason about to be able to autonomously travel to, collect, and analyse a sample?

During the entry, the Mars Rover needs to decide how to make a successful landing by using the information of the angle, velocity and position of the rover, the atmospheric density and temperature of the Mars.

When walking on the surfaces of Mars, Mars Rover plans the route to arrive at the destination and judges the hazardous regions, not only through the information mentioned above but also the terrain and slip.

As to collecting and analyzing, based on the previously collected data and the composition of minerals and gases, the Mars Rover needs to infer whether the collected samples are valuable.

Moreover, it is also necessary to judge how to operate the next step according to the power, memory and other consumption.

* How might the environment the Mars Rover is situated in disrupt its plans?

Because of the frequency of sandstorms on Mars, thick sand is fatal to sensors, cameras and micromechanical systems.

A complicated terrain environment such as sand and pit will cause the Mars Rover to be destroyed.

Unknown soil might damage the drill of the Mars rover or the sophisticated experimental equipment in the body.