CLAIMS

WHAT IS CLAIMED IS:

1. A polishing device comprising:

a polishing pad;

a top ring which presses a substrate against the polishing pad to polish the substrate;

a liquid injection nozzle which injects a polishing liquid in a fan shape on the polishing pad;

a nozzle moving device which moves the liquid injection nozzle in a radial direction of the polishing pad; and

an operation control unit which controls an operation of the nozzle moving device,

wherein the operation control unit comprises a storage device which stores a program, and a processing device which performs a calculation in accordance with the program, and

the program comprises commands of:

obtaining a correlation between a supply position of the polishing liquid in the radial direction of the polishing pad using the liquid injection nozzle and an average polishing rate of the substrate and an in-plane distribution of a polishing rate of the substrate;

determining a movable range of the liquid injection nozzle according to a predetermined range of an allowable average polishing rate and the correlation between the supply position of the polishing liquid and the average polishing rate;

determining an optimal supply position of the polishing liquid from the correlation between the supply position of the polishing liquid and the in-plane distribution of the polishing rate of the substrate within the determined movable range of the liquid injection nozzle; and

moving the liquid injection nozzle to the determined supply position to polish the substrate.

2. The polishing device according to claim 1, further comprising a film thickness measurement sensor which measures a film thickness on the substrate,

wherein the program comprises commands of:

measuring a residual film distribution on the substrate using the film thickness measurement sensor;

determining distribution of a target polishing amount according to a difference between the measured residual film distribution and a predetermined target residual film distribution;

determining the optimal supply position of the polishing liquid within the determined movable range of the liquid injection nozzle from the target polishing amount distribution and the correlation between the supply position of the polishing liquid and the in-plane distribution

of the polishing rate of the substrate; and

moving the liquid injection nozzle to the determined supply position.

3. The polishing device according to claim 2,

wherein the program comprises commands of:

obtaining a polishing rate distribution during actual polishing from a change with a lapse of time of the measured residual film distribution; and

determining a target control range corresponding to the target polishing amount according to the polishing rate distribution during the actual polishing, wherein the target control range is a range of a polishing rate having a predetermined width including the average polishing rate.

4. The polishing device according to claim 2,

wherein the program obtains a polishing rate distribution during actual polishing from a change with a lapse of time of the measured residual film distribution, and determines a target polishing rate distribution corresponding to the target polishing amount according to the polishing rate distribution during the actual polishing.

5. A polishing method comprising:

obtaining a correlation between a supply position of a polishing liquid in a radial direction of a polishing pad using a liquid injection nozzle which injects the polishing liquid onto the polishing pad in a fan shape and an average polishing rate of a substrate and an in-plane distribution of a polishing rate of the substrate;

determining a movable range of the liquid injection nozzle from a predetermined range of an allowable average polishing rate and the correlation between the supply position of the polishing liquid and the average polishing rate;

determining an optimal supply position of the polishing liquid from the correlation between the supply position of the polishing liquid and the in-plane distribution of the polishing rate of the substrate within the determined movable range of the liquid injection nozzle; and

moving the liquid injection nozzle to the determined supply position to polish the substrate.

6. The polishing method according to claim 5, further comprising:

measuring a residual film distribution on the substrate using a film thickness measurement sensor which measures a film thickness on the substrate;

determining a target polishing amount distribution according to a difference between the

measured residual film distribution and a predetermined target residual film distribution;

determining the optimal supply position of the polishing liquid within the determined movable range of the liquid injection nozzle from the target polishing amount distribution and the correlation between the supply position of the polishing liquid and the in-plane distribution of the polishing rate of the substrate; and

moving the liquid injection nozzle to the determined supply position.

7. The polishing method according to claim 6, further comprising:

obtaining a polishing rate distribution during actual polishing from a change with a lapse of time of the measured residual film distribution; and

determining a target control range corresponding to the target polishing amount distribution according to the polishing rate distribution during the actual polishing, wherein the target control range is a range of a polishing rate having a predetermined width including the average polishing rate.

8. The polishing method according to claim 6, further comprising:

obtaining a polishing rate distribution during actual polishing from a change with a lapse of time of the measured residual film distribution; and

determining a target polishing rate distribution corresponding to the target polishing amount according to the polishing rate distribution during the actual polishing.

9. A non-transitory computer-readable recording medium for recording a program which causes a computer to execute steps of:

obtaining a correlation between a supply position of a polishing liquid in a radial direction of a polishing pad using a liquid injection nozzle which injects the polishing liquid onto the polishing pad in a fan shape and an average polishing rate of a substrate and an in-plane distribution of a polishing rate of the substrate;

determining a movable range of the liquid injection nozzle from a predetermined range of an allowable average polishing rate and the correlation between the supply position of the polishing liquid and the average polishing rate;

determining an optimal supply position of the polishing liquid from the correlation between the supply position of the polishing liquid and the in-plane distribution of the polishing rate of the substrate within the determined movable range of the liquid injection nozzle; and

moving the liquid injection nozzle to the determined supply position to polish the substrate.

10. The recording medium according to claim 9,

wherein the program comprises steps of:

measuring a residual film distribution on the substrate using a film thickness measurement sensor which measures a film thickness on the substrate;

determining a target polishing amount distribution according to a difference between the measured residual film distribution and a predetermined target residual film distribution;

determining the optimal supply position of the polishing liquid within the determined movable range of the liquid injection nozzle from the target polishing amount distribution and the correlation between the supply position of the polishing liquid and the in-plane distribution of the polishing rate of the substrate; and

moving the liquid injection nozzle to the determined supply position.

11. The recording medium according to claim 10,

wherein the program comprises steps of:

obtaining a polishing rate distribution during actual polishing from a change with a lapse of time of the measured residual film distribution; and

determining a target control range corresponding to the target polishing amount distribution according to the polishing rate distribution during the actual polishing, wherein the target control range is a range of a polishing rate having a predetermined width including the average polishing rate.

12. The recording medium according to claim 10,

wherein the program comprises steps of:

obtaining a polishing rate distribution during actual polishing from a change with a lapse of time of the measured residual film distribution; and

determining a target polishing rate distribution corresponding to the target polishing amount according to the polishing rate distribution during the actual polishing.