



and the position of the sun in the sky.

3. Hour Angle Calculation (`hour_angle`):

- The hour angle represents how far the sun is from the local meridian at sunrise and sunset. It is calculated based on latitude and the solar declination, and it helps to determine the times for sunrise and sunset.

4. Solar Noon and Time Conversion:

- Solar noon occurs when the sun is highest in the sky. The program assumes solar noon occurs at 12:00 UTC adjusted for the longitude. The times for sunrise and sunset are derived from the hour angle relative to solar noon.

5. Time Conversion to Local Time:

- The `pytz` library handles the conversion of times from UTC to the local time in Hamburg, including adjusting for daylight saving time (CEST in summer and CET in winter).

6. Sunshine Duration:

- The difference between the local sunset and sunrise times gives the sunshine duration, which represents how long the sun is above the horizon (daylight hours).

Example Output:

plaintext

Code kopieren

```
Sunrise (local time): 07:36:00
```

```
Sunset (local time): 17:02:00
```

```
Sunshine duration: 9:26:00
```

This program will correctly calculate and print the sunrise, sunset, and total duration of daylight for Hamburg, Germany, considering the local time (CET or CEST) depending on the time of year.



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