Program Manual

Author: Liang Zhongyou

Function Overview

This program is developed based on Visual Basic 2010 and is designed to calculate the Air Quality Index (AQI) according to the **Ambient Air Quality Standards** (GB 3095-2012) and provide an evaluation of the air quality level.

Program Overview

The program assesses six air pollutants: **SO_2 (Sulfur Dioxide), NO_2 (Nitrogen Dioxide), PM_{10}, $PM_{2.5}$ (Particulate Matter), O_3 (Ozone), and CO (Carbon Monoxide).**

Evaluation Process

1. The first step is to compare the measured concentration values of each pollutant against the graded concentration limits specified in the **GB 3095-2012** standard. The **Individual Air Quality Index (IAQI)** for each pollutant is calculated using the following formula:

   $$IAQIP=(BPHi-BPLo)(CP-BPLo)\times(IAQIHi-IAQILo)+IAQILo$$

   Where:

   - **IAQI_P** = Individual Air Quality Index of pollutant P
   - **CP** = Measured concentration of pollutant P
   - **BPHi** = Upper limit of the concentration range closest to CP (as per AQI index table)
   - **BPLo** = Lower limit of the concentration range closest to CP (as per AQI index table)
   - **IAQIHi** = IAQI value corresponding to **BPHi**
   - **IAQILo** = IAQI value corresponding to **BPLo**
2. The second step is to determine the **AQI** as the maximum IAQI among all pollutants. If the **AQI exceeds 50**, the pollutant with the highest IAQI is identified as the **primary pollutant**:

   $$AQI=\max(IAQI1,IAQI2,...,IAQIn)$$

   Where:

   - **IAQI** = Individual Air Quality Index
   - **n** = Number of pollutants
3. The third step is to classify the air quality level based on the AQI value, determine the air quality category, display the corresponding color, and provide **health impact guidance and recommended measures**.

   In summary, **AQI is the maximum IAQI among all pollutants.**

Reference Data for AQI Calculation

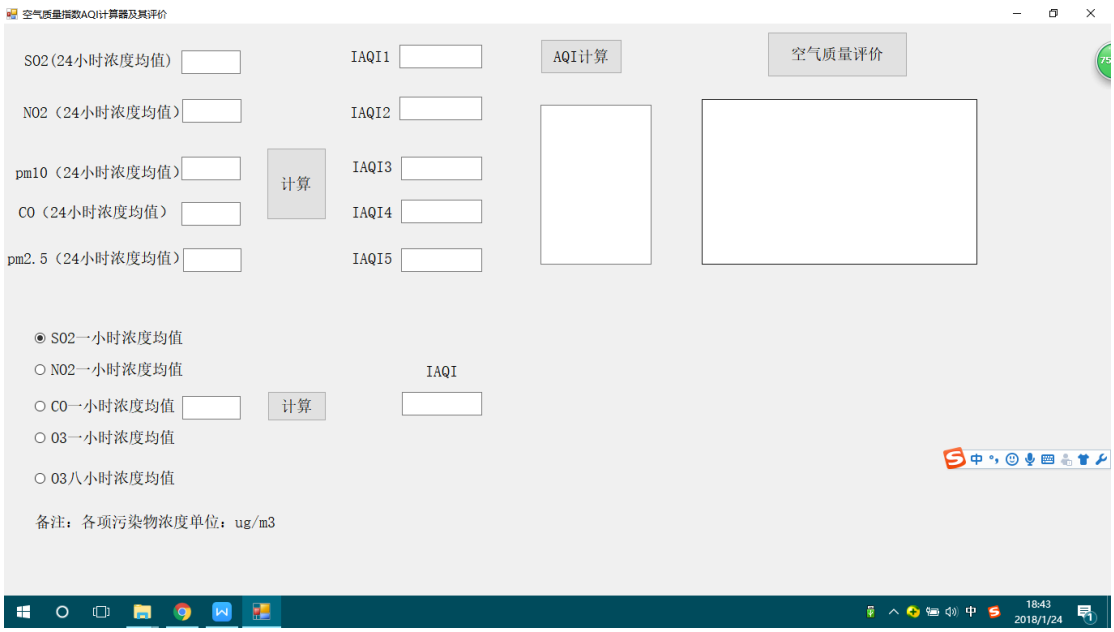
表 1　空气质量分指数及对应的污染物项目浓度限值

空气质量分指数（IAQI）	污染物项目浓度限值									
	二氧化硫（SO_2）24 小时平均/（$\mu g/m^3$）	二氧化硫（SO_2）1 小时平均/（$\mu g/m^3$）(1)	二氧化氮（NO_2）24 小时平均/（$\mu g/m^3$）	二氧化氮（NO_2）1 小时平均/（$\mu g/m^3$）(1)	颗粒物（粒径小于等于 10μm）24 小时平均/（$\mu g/m^3$）	一氧化碳（CO）24 小时平均/（mg/m^3）	一氧化碳（CO）1 小时平均/（mg/m^3）(1)	臭氧（O_3）1 小时平均/（$\mu g/m^3$）	臭氧（O_3）8 小时滑动平均/（$\mu g/m^3$）	颗粒物（粒径小于等于 2.5μm）24 小时平均/（$\mu g/m^3$）
0	0	0	0	0	0	0	0	0	0	0
50	50	150	40	100	50	2	5	160	100	35
100	150	500	80	200	150	4	10	200	160	75
150	475	650	180	700	250	14	35	300	215	115
200	800	800	280	1 200	350	24	60	400	265	150
300	1 600	(2)	565	2 340	420	36	90	800	800	250
400	2 100	(2)	750	3 090	500	48	120	1 000	(3)	350
500	2 620	(2)	940	3 840	600	60	150	1 200	(3)	500
说明：	(1) 二氧化硫（SO_2）、二氧化氮（NO_2）和一氧化碳（CO）的 1 小时平均浓度限值仅用于实时报，在日报中需使用相应污染物的 24 小时平均浓度限值。 (2) 二氧化硫（SO_2）1 小时平均浓度值高于 800 $\mu g/m^3$ 的，不再进行其空气质量分指数计算，二氧化硫（SO_2）空气质量分指数按 24 小时平均浓度计算的分指数报告。 (3) 臭氧（O_3）8 小时平均浓度值高于 800 $\mu g/m^3$ 的，不再进行其空气质量分指数计算，臭氧（O_3）空气质量分指数按 1 小时平均浓度计算的分指数报告。									

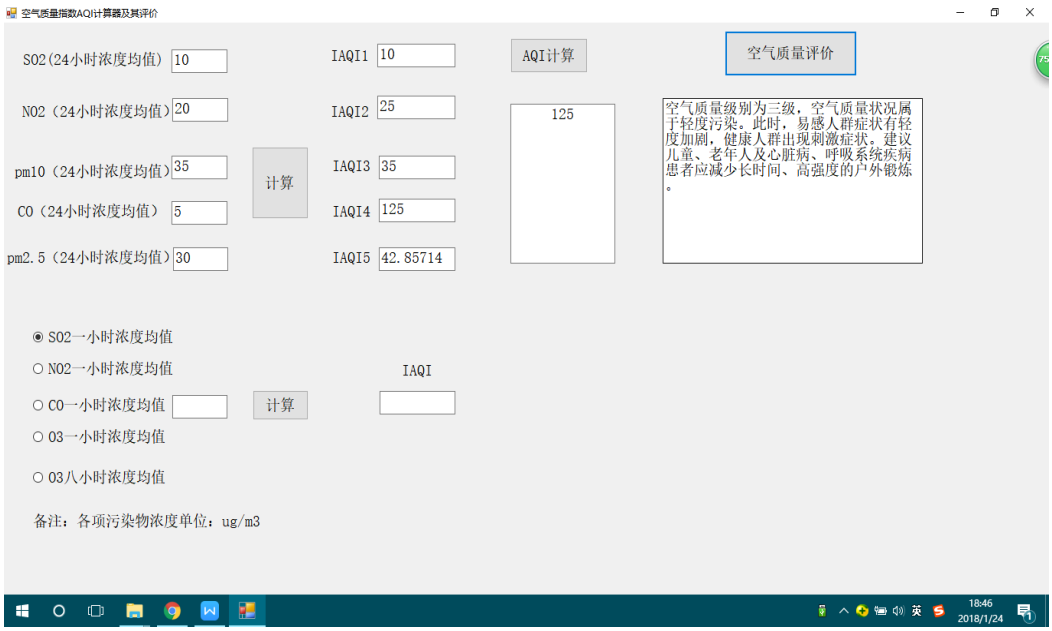
Program Interface and Usage Guide

Main Interface

Upon opening the program, the following interface appears:

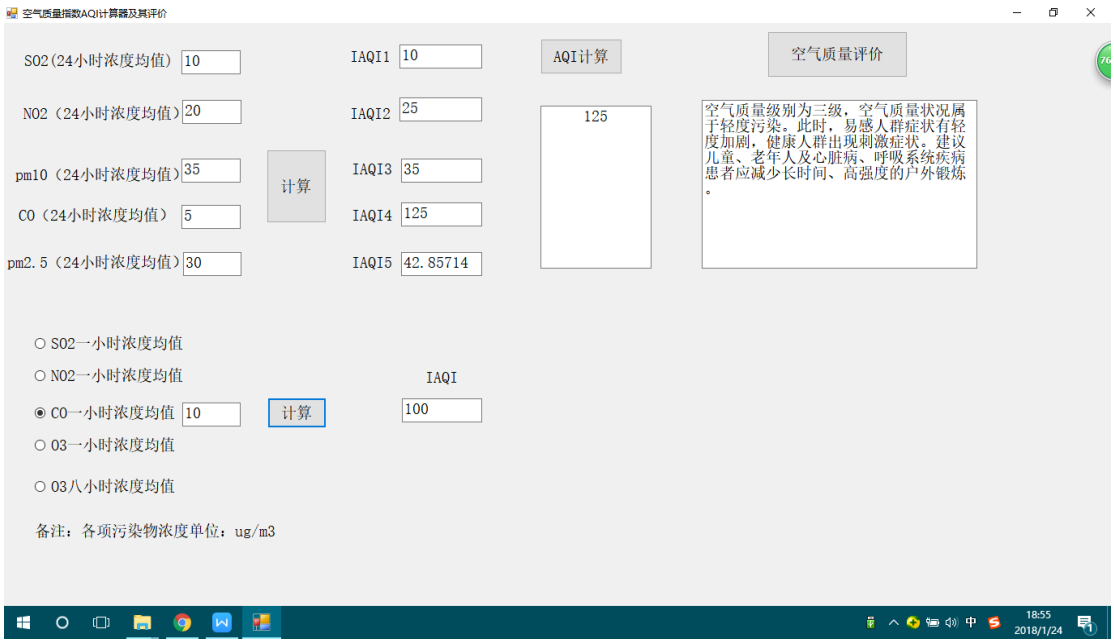


- Users must **input the 24-hour average concentration values** of the measured pollutants into the respective input fields.
- Clicking the **"Calculate"** button computes the **IAQI** for each pollutant.
- Clicking the **"AQI Calculation"** button calculates the AQI for the day.
- Clicking the **"Air Quality Evaluation"** button provides an assessment of air quality.



Real-Time IAQI Calculation

- If **hourly IAQI values** are needed, users must:
    1. Select the pollutant to be calculated.
    2. Enter the **1-hour average concentration** in the input field.
    3. Click the **"Calculate"** button to compute the IAQI automatically.



Conclusion

This program provides **a convenient way to calculate the Air Quality Index (AQI)** and can also compute the **hourly IAQI** for pollutants. It is suitable for **real-time monitoring, reporting, and evaluation**. The program is **easy to use, practical, and efficient**.