**Measurement Setup**

Before studying the wear of stairs, archaeologists must collect a variety of information about the target stairs to support subsequent modeling and analysis. This includes the following three components: measurement, literature search, and data preprocessing.

1. **Measurement**

To ensure that the measurements are non-destructive, inexpensive, and can be done by a small number of people using minimal tools while maximizing the accuracy of the measurements, the following tools and measurement methods are chosen:

**（表）**

**Measurement and data preprocessing of the depth of wear on stairs**

Choose 20 steps of the target stairs and complete the following operations using the laser rangefinder and the vernier caliper for one steps:

1. Fix the laser range finder in a constant horizontal plane using a sliding table and set the height of the stair root as the reference height;

2. Randomly select 100 sample points for each square meter of the stair plane and record the 2D coordinates (x,y) of each sample point and its measured height.

3. Corners and other data that cannot be measured with a laser distance meter are measured with vernier calipers.

Next, based on the data obtained from the measurements, we can use the following formula to calculate the depth of wear for each sampling point:

\[ \Delta h = h\_{\text{sampling point}} - h\_{\text{reference}} \]

All the (x, y, Δh\Delta hΔh) data from the sampling points will be integrated to construct the subsequent ideal staircase wear model.

**Step size measurement and data preprocessing**

Randomly select 10 steps from the target staircase and use a meter rule to measure the length, width, and height of each step，record the data for each group and calculate the average to obtain the standard dimensions of the steps：

L\_{\text{average}} = \frac{\sum\_{i=1}^{10} L\_i}{10}

\quad W\_{\text{average}} = \frac{\sum\_{i=1}^{10} W\_i}{10}

\quad H\_{\text{average}} = \frac{\sum\_{i=1}^{10} H\_i}{10}​

2.**Data Retrieval from Literature and Sources**

The required information includes the construction and maintenance years, which can be determined through historical records or archaeological literature to estimate the approximate construction date and the timing of any renovations. Additionally, the material and mechanical properties of the staircase must be identified, either through a literature review or direct observation. Specifically, it is necessary to determine the primary material of the stairs and gather the following mechanical property parameters:

elastic modulus E

poisson ratio ν

coefficient of wear k

material hardness H

\begin{table}[h!]

\centering

\caption{Material Properties for Analysis}

\label{tab:material\_properties}

\begin{tabular}{@{}ll@{}}

\toprule

\textbf{Property} & \textbf{Symbol} \\

\midrule

Elastic Modulus & \( E \) \\

Poisson Ratio & \( \nu \) \\

Coefficient of Wear & \( k \) \\

Material Hardness & \( H \) \\

\bottomrule

\end{tabular}