

100囚犯抽签问题

一、算法说明

实现两种囚犯策略的蒙特卡洛模拟：

1.随机策略：

每个囚犯随机打开50个盒子

成功条件：所有囚犯都在50次内找到自己编号

2.循环策略：

囚犯从自己编号的盒子开始

按照盒内纸条编号跳转到下一个盒子

成功条件：所有循环长度 50

二、优化思路

1.高效排列生成：使用numpy.random.permutation生成随机盒子配置

2.向量化操作：批量处理模拟轮次，减少循环开销

3.提前终止：任一囚犯失败时立即停止当前模拟

4.数据收集：记录循环长度分布用于分析

三、实验结果

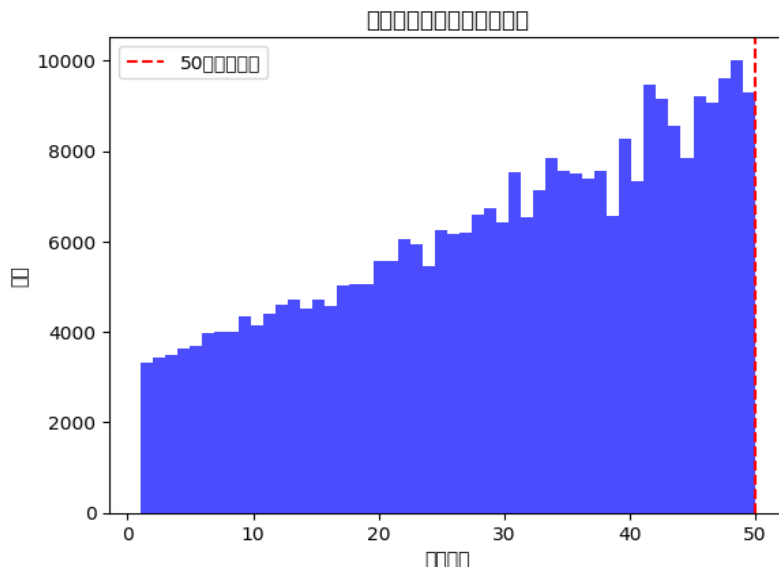
✓ 运行成功

模拟设置：100囚犯，每人50次尝试，10000轮实验

随机策略成功率：0.0000（耗时：0.44秒）

循环策略成功率：0.3081（耗时：2.11秒）

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/opt/mamba/lib/python3.10/site-packages/IPython/core/pylabtools.py:152: UserWarning: Glyph 39057 (\N{CJK UNIFIED IDEOGRAPH-9891}) missing from font(s) DejaVu Sans.
fig.canvas.print_figure(bytes_io, **kw)
/opt/mamba/lib/python3.10/site-packages/IPython/core/pylabtools.py:152: UserWarning: Glyph 29575 (\N{CJK UNIFIED IDEOGRAPH-7387}) missing from font(s) DejaVu Sans.
fig.canvas.print_figure(bytes_io, **kw)
/opt/mamba/lib/python3.10/site-packages/IPython/core/pylabtools.py:152: UserWarning: Glyph 24490 (\N{CJK UNIFIED IDEOGRAPH-5FAA}) missing from font(s) DejaVu Sans.
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/opt/mamba/lib/python3.10/site-packages/IPython/core/pylabtools.py:152: UserWarning: Glyph 29615 (\N{CJK UNIFIED IDEOGRAPH-73AF}) missing from font(s) DejaVu Sans.
fig.canvas.print_figure(bytes_io, **kw)
/opt/mamba/lib/python3.10/site-packages/IPython/core/pylabtools.py:152: UserWarning: Glyph 31574 (\N{CJK UNIFIED IDEOGRAPH-7B56}) missing from font(s) DejaVu Sans.
fig.canvas.print_figure(bytes_io, **kw)
/opt/mamba/lib/python3.10/site-packages/IPython/core/pylabtools.py:152: UserWarning: Glyph 30053 (\N{CJK UNIFIED IDEOGRAPH-7565}) missing from font(s) DejaVu Sans.
fig.canvas.print_figure(bytes_io, **kw)
/opt/mamba/lib/python3.10/site-packages/IPython/core/pylabtools.py:152: UserWarning: Glyph 19979 (\N{CJK UNIFIED IDEOGRAPH-4E0B}) missing from font(s) DejaVu Sans.
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/opt/mamba/lib/python3.10/site-packages/IPython/core/pylabtools.py:152: UserWarning: Glyph 30340 (\N{CJK UNIFIED IDEOGRAPH-7684}) missing from font(s) DejaVu Sans.
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/opt/mamba/lib/python3.10/site-packages/IPython/core/pylabtools.py:152: UserWarning: Glyph 38271 (\N{CJK UNIFIED IDEOGRAPH-957F}) missing from font(s) DejaVu Sans.
fig.canvas.print_figure(bytes_io, **kw)
/opt/mamba/lib/python3.10/site-packages/IPython/core/pylabtools.py:152: UserWarning: Glyph 24230 (\N{CJK UNIFIED IDEOGRAPH-5EA6}) missing from font(s) DejaVu Sans.
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/opt/mamba/lib/python3.10/site-packages/IPython/core/pylabtools.py:152: UserWarning: Glyph 20998 (\N{CJK UNIFIED IDEOGRAPH-5206}) missing from font(s) DejaVu Sans.
fig.canvas.print_figure(bytes_io, **kw)
/opt/mamba/lib/python3.10/site-packages/IPython/core/pylabtools.py:152: UserWarning: Glyph 24067 (\N{CJK UNIFIED IDEOGRAPH-5E03}) missing from font(s) DejaVu Sans.
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/opt/mamba/lib/python3.10/site-packages/IPython/core/pylabtools.py:152: UserWarning: Glyph 27425 (\N{CJK UNIFIED IDEOGRAPH-6B21}) missing from font(s) DejaVu Sans.
fig.canvas.print_figure(bytes_io, **kw)
/opt/mamba/lib/python3.10/site-packages/IPython/core/pylabtools.py:152: UserWarning: Glyph 23581 (\N{CJK UNIFIED IDEOGRAPH-5C1D}) missing from font(s) DejaVu Sans.
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/opt/mamba/lib/python3.10/site-packages/IPython/core/pylabtools.py:152: UserWarning: Glyph 35797 (\N{CJK UNIFIED IDEOGRAPH-8BD5}) missing from font(s) DejaVu Sans.
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/opt/mamba/lib/python3.10/site-packages/IPython/core/pylabtools.py:152: UserWarning: Glyph 21046 (\N{CJK UNIFIED IDEOGRAPH-5236}) missing from font(s) DejaVu Sans.
fig.canvas.print_figure(bytes_io, **kw)
```



不同参数下的成功率：

N=100, K=25: 1.0000

N=200, K=25: 1.0000

N=200, K=50: 1.0000

N=200, K=75: 1.0000