

基于历史事件日志挖掘的 智能家居场景TAP规则生成

刘力玮, 陈伟, 汪涛, 王伟, 吴国全, 魏峻

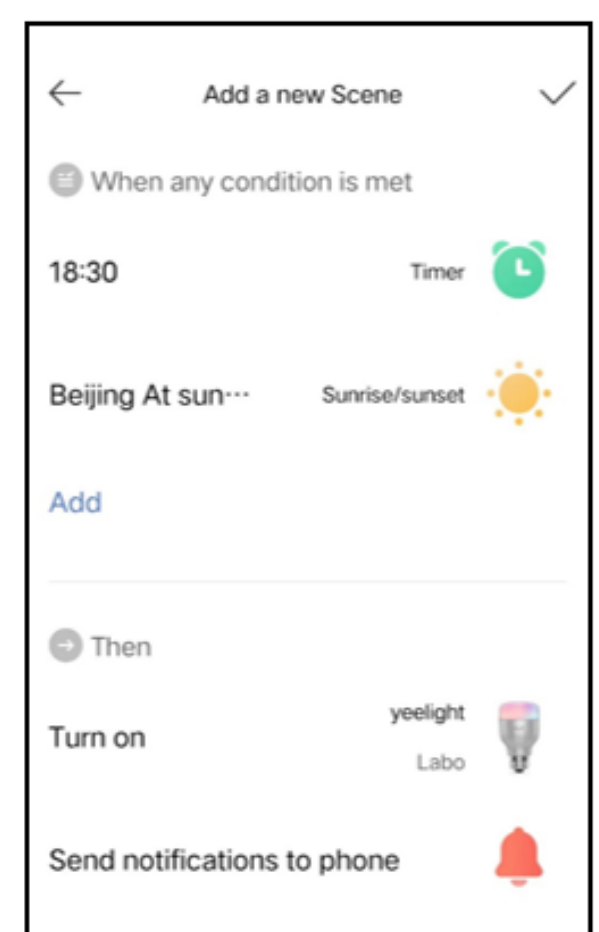
Generating Scenario-Centric TAP Rules for Smart Homes by Mining Historical Event Logs

The 30th IEEE International Conference on Web Services (ICWS'23)

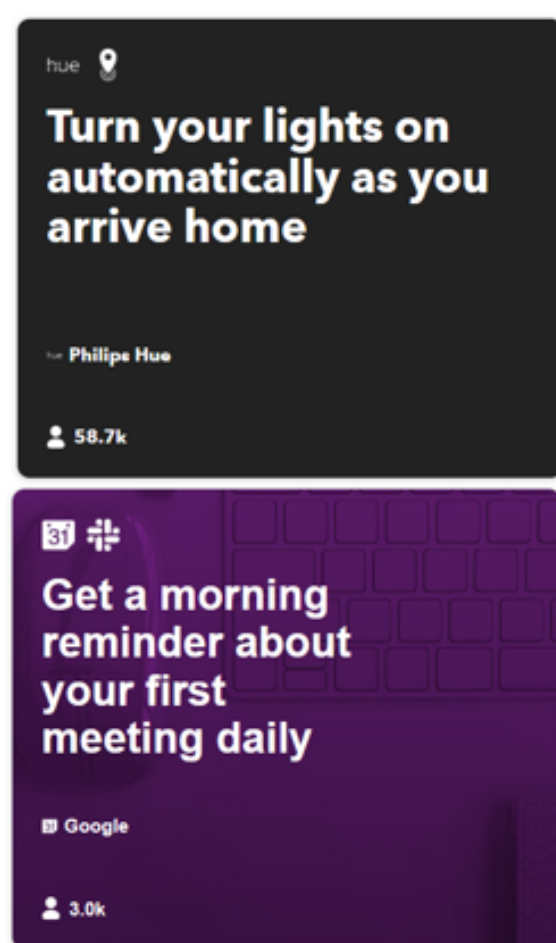
联系方式: 陈伟, chenwei@otcaix.iscas.ac.cn

以场景为中心的TAP规则

Scenario-centric TAP rules

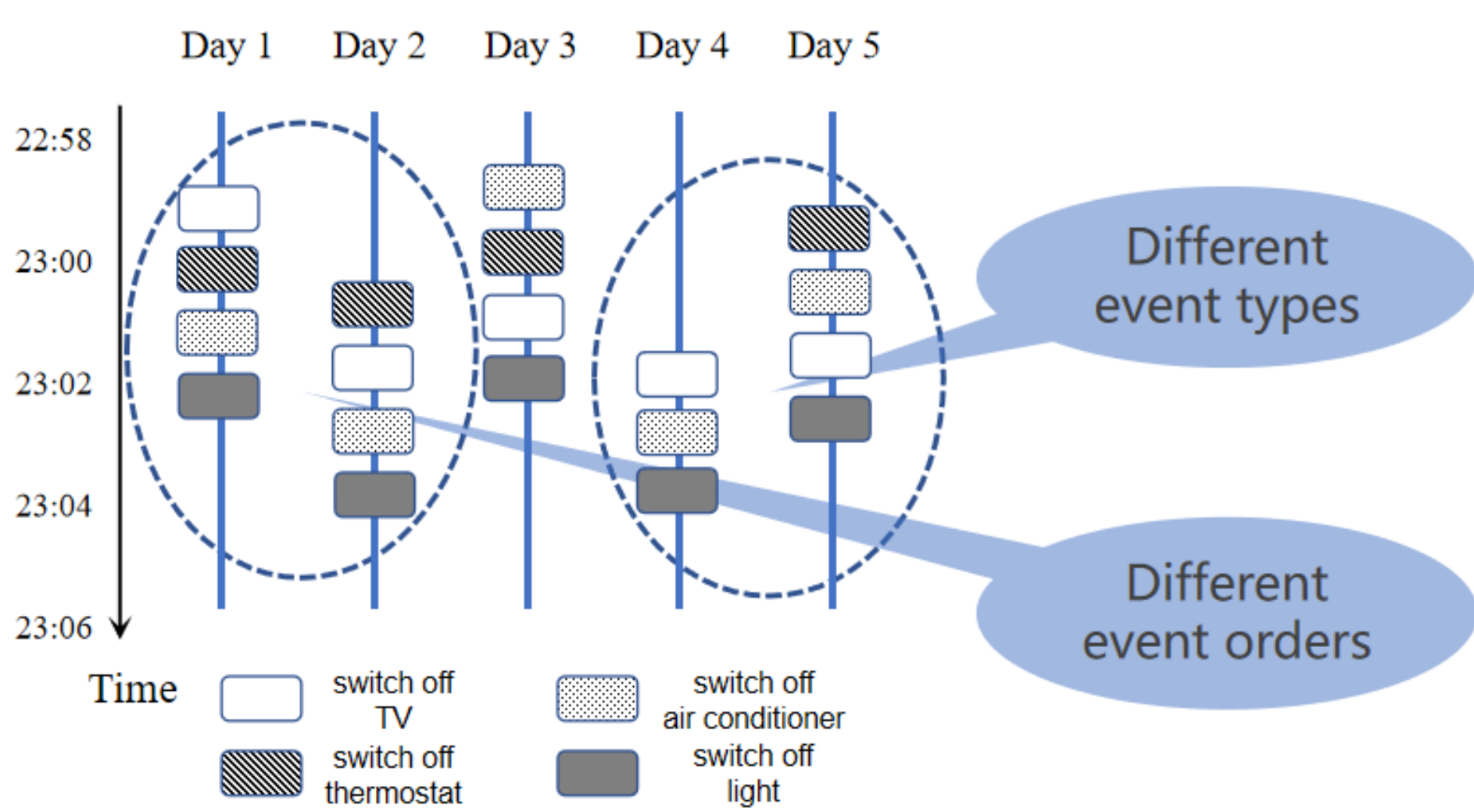


Simple TAP rules



- TAP (Trigger-Action Programming) 是智能家居常见的终端用户编程范式
- 以场景为中心的TAP规则
- 实现用户的场景化意图
- 包含更多的事件
- 满足更复杂的用户需求

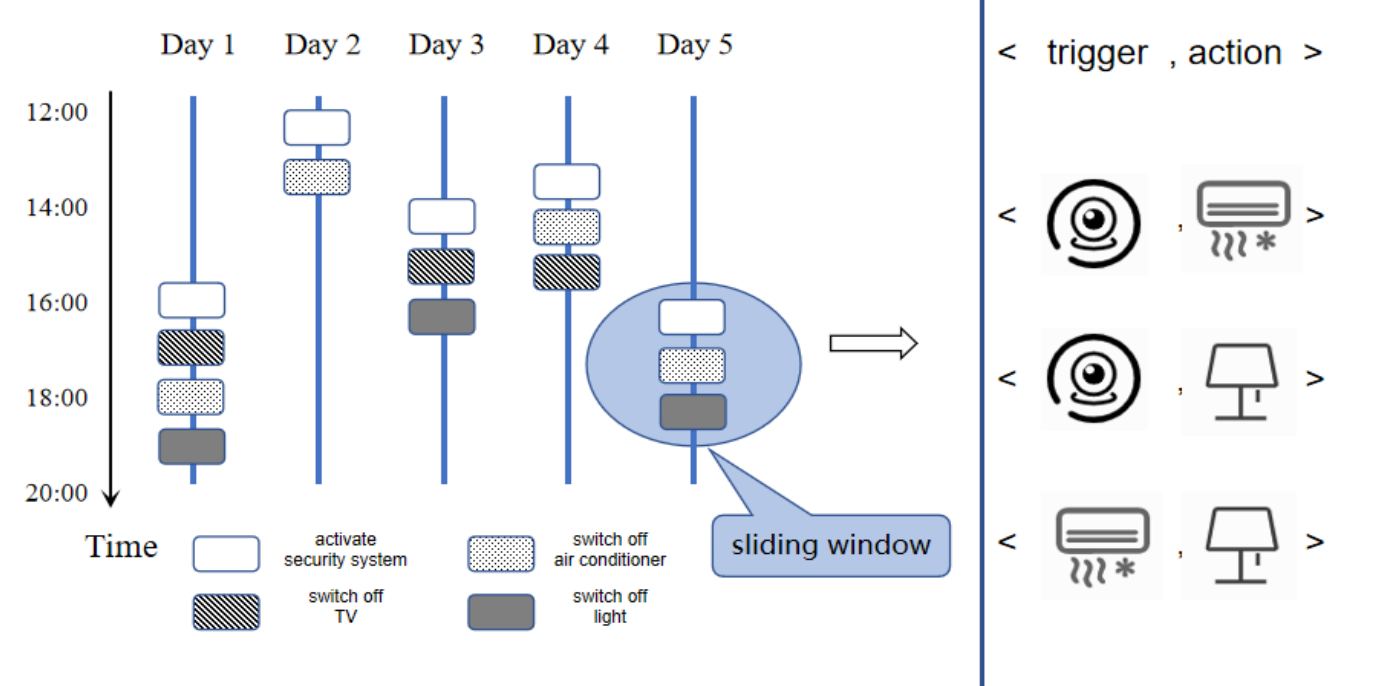
Activity: Sleeping



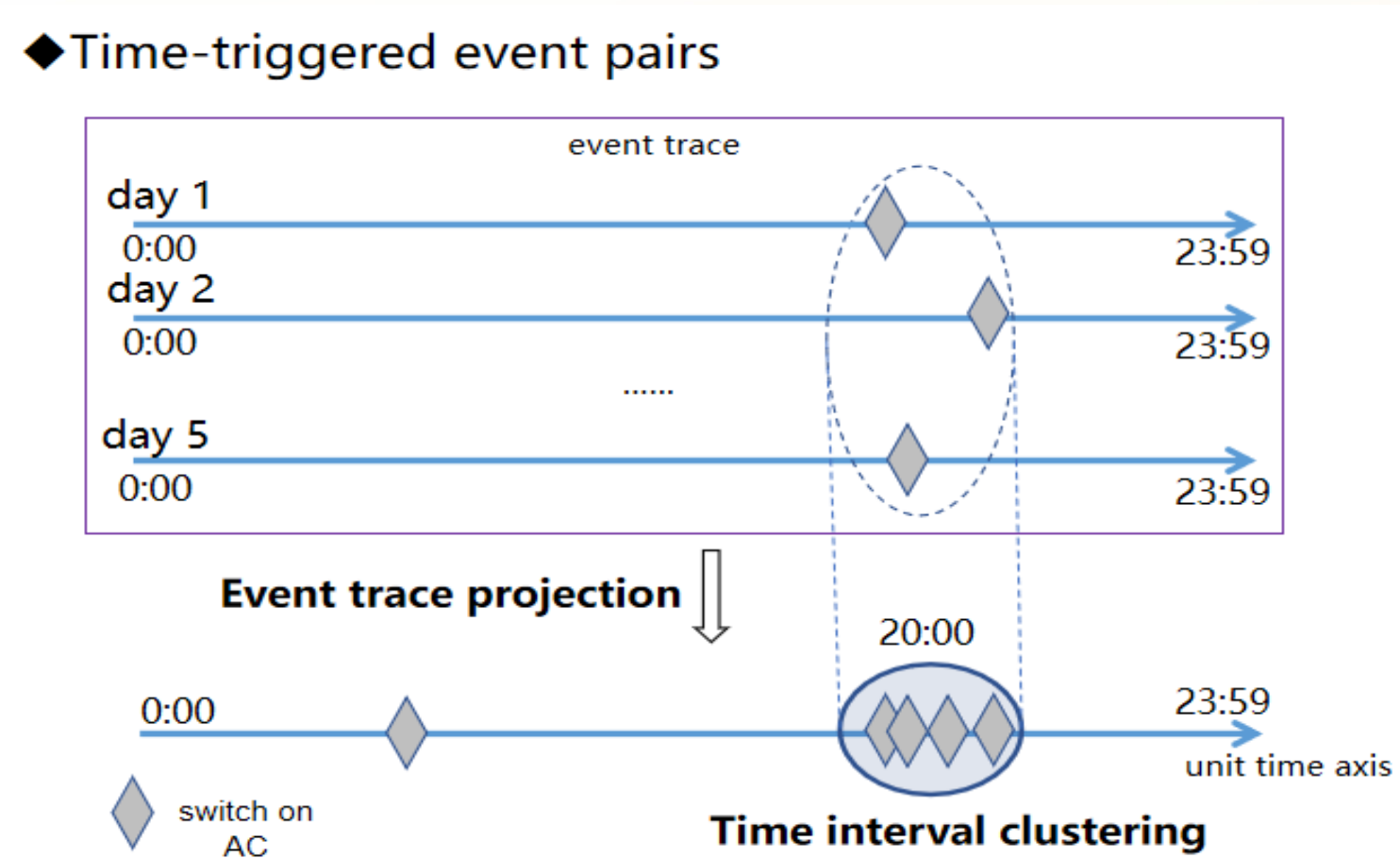
- 场景TAP规则的编写较为复杂, 需要用户拥有一定的领域知识, 同时明确自身的需求
- 用户活动以及潜在场景的随机性 (相同活动下用户执行设备操作的数量和顺序的变化) 导致传统频繁序列模式挖掘算法不再适用

基于历史事件日志挖掘的场景TAP规则生成方法

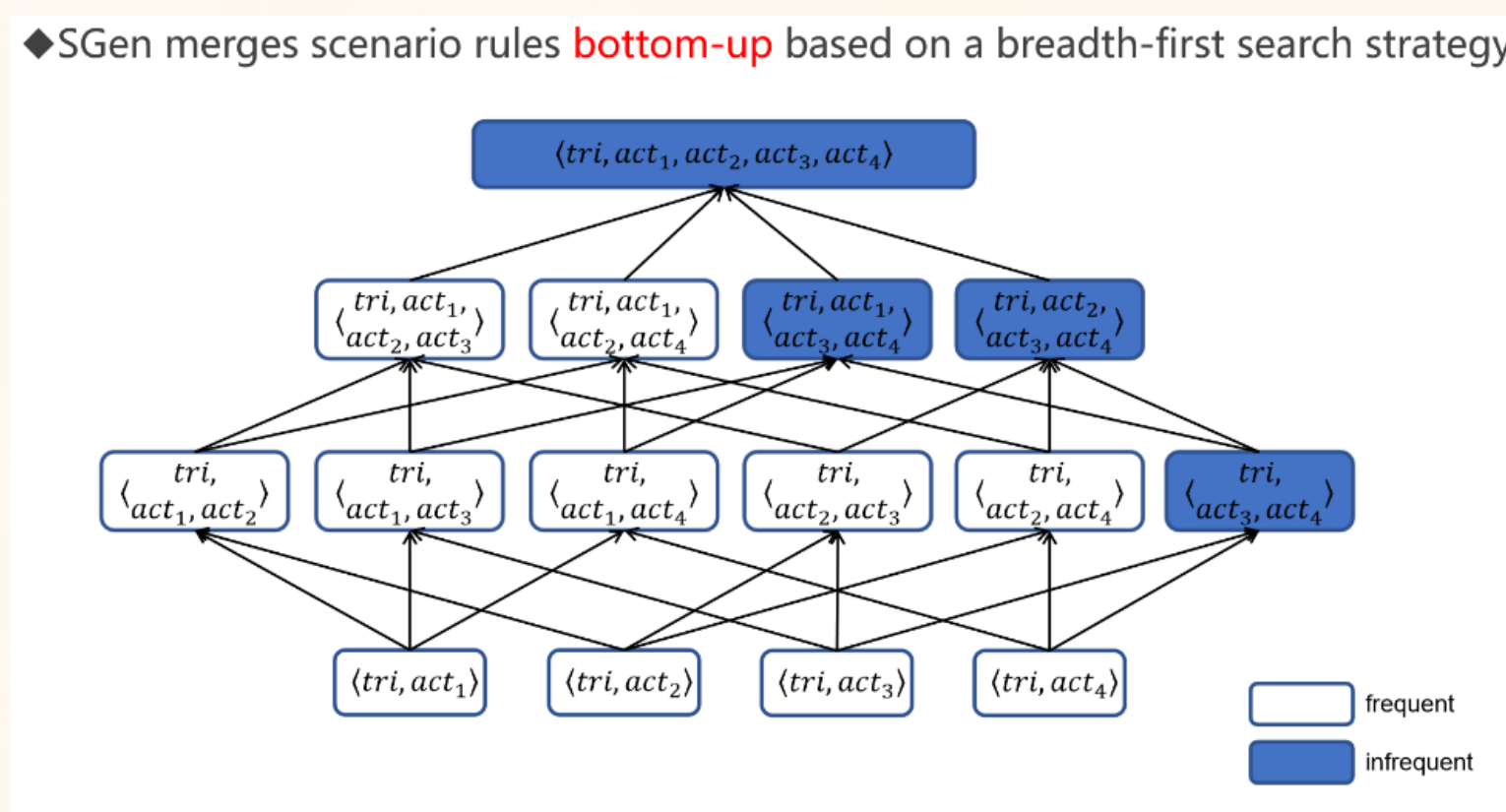
Event-triggered event pairs



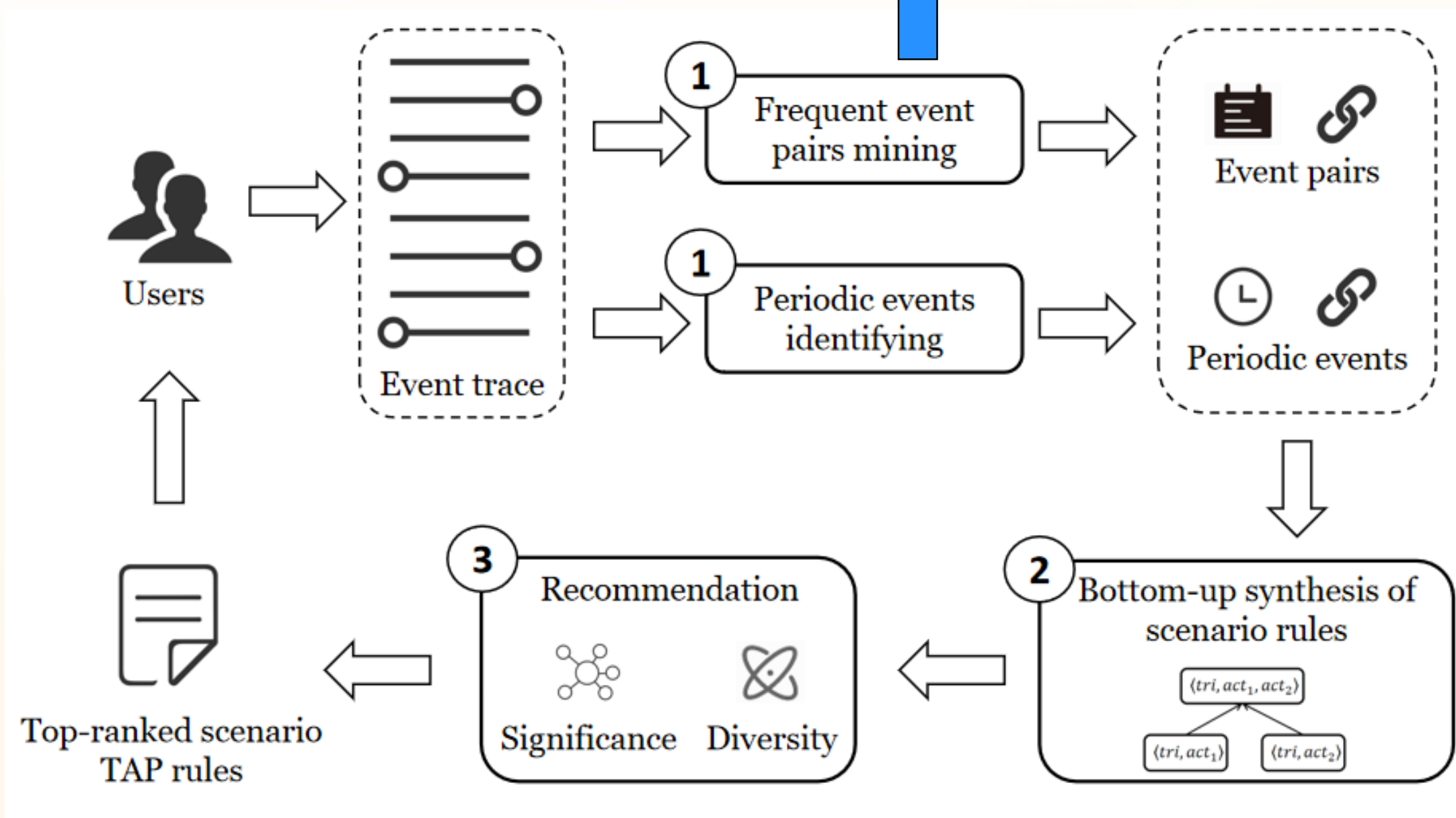
基于时间间隔, 对投影在单位时间轴上的事件进行聚类



自底向上的关联场景TAP规则合成



基于滑动时间窗口的
频繁事件对挖掘



实验评估

准确率

Can the TAP rules generated by SGen match users' scenarios?
Align with the preset scenarios

Rank	TAP rule	Activity
1	IF HallToiletDoor changes to off, THEN HallBathroomDoor switches on, HallBathroomDoor switches off, ToiletFlush switches on and ToiletFlush switches off	Leave house
2	IF HallBedroomDoor changes to on, THEN HallBathroomDoor switches on, HallBathroomDoor switches off, ToiletFlush switches on and ToiletFlush switches off	Use toilet
3	IF PlatesCupboard changes to off, THEN Fridge switches on, Fridge switches off, GroceriesCupboard switches on and GroceriesCupboard switches off	Take shower
4	IF CupsCupboard changes to on, THEN Fridge switches on and Fridge switches off	Go to bed
5	IF Freezer changes to off, THEN Fridge switches on and Fridge switches off	Prepare Breakfast
		Prepare Dinner
		Get drink

Rule	Dataset	Precision@3	Precision@5	Precision@7
ETS	Kasteren	100%	100%	71.4%
	SGData	100%	-	-
TTS	Kasteren	100%	80%	71.4%
	SGData	100%	-	-

Precision@k are all over 70%

有效性

Are the scenario rules generated by SGen efficient in meeting user requirements?
Coverage of the top 10 simple rules generated by TAGen

