Software Requirements Specification

Project: 校园超速监控系统

Authors: XXX

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# Introduction

## Purpose

Delineate the purpose of the software to be specified.

在这里描述软件的开发目的

【示例】本软件系统的主要目的是监控校园内行驶车辆的超速行为，从而对驾驶员进行警示教育以及对频繁超速的车辆进行限制入校管控。

当代高校图书馆面临着大量图书的管理和借阅工作，需要具备高效的业务办理能力以应对日益增长的读者需求。然而，传统的人工操作方式已经无法满足这种需求，因此，图书自助借还系统的开发旨在提升学校图书馆的服务水平和工作效率。

该系统将使用自助借还机分布于图书馆的不同位置，并通过校园局域网连接到一个中央服务器上，实现自助借还功能。用户可以通过插入校园卡来完成身份验证和功能操作，包括借阅、续借和归还等。该系统还会在借阅过程中进行规定的限制，例如每个用户的借阅数量和借阅时间等。同时，系统会通过外部的短信发送系统向借阅者发送即将到期通知，以便更好地管理图书资源。

因此，本软件系统的主要目的是提供一种高效的图书管理和借阅方式，减轻图书馆工作人员的负担，为学校师生提供方便快捷的服务，同时确保借阅规定的合法性，并及时提醒用户归还或续借图书，从而更好地管理图书资源。

## Scope

Describe the scope of the software under consideration by:

a) identifying the software product(s) to be produced by **name** (e.g., Host DBMS, Report Generator, etc.); 正在开发什么产品

b) explaining what the software product(s) will **do**; 解释产品的功能

c) describing the **application** of the software being specified, including relevant **benefits**, **objectives**

and goals; 产品的应用

d) being consistent with similar statements in higher-level specifications (e.g., a system requirements specification), if they exist. 高级别类别

【示例】本软件系统称之为“校园超速监控系统”。

该系统会：1) 通过安装在校园关键路段的车速检测器实时监控车辆的车速，并记录车速信息; 2) 识别超出校园安全车速上限的车辆，对驾驶员进行警示教育; 3) 在每季度的最后一天对车速记录进行统计，将超出季度超速次数限制的车辆加入临时黑名单，限制入校; 4) …

通过将该系统部署到校园内，可以实时监控校园内的超速行为，有助于规范校园管理、维护校园安全环境

该软件系统为“图书自助借还系统”。本系统将在现有图书管理系统的基础上开发，客户端为自助借还机，分布于图书馆的不同位置，并通过校园局域网连接到一个中央服务器上。通过客户端服务端系统结构完成图书的自助借还功能。

该系统允许在校师生自行完成书籍的借阅、续借和归还操作：

1. 用户将校园卡插入读卡器之后，会开始验证过程，校园卡有效、没有过期且未被挂失时，便可以开启功能操作
2. 用户可以扫描每本书籍的条形码，并设置借阅到期时间即可完成借阅
3. 用户可以从自己的借阅记录中选择书籍进行续借
4. 用户也可以自行扫描书籍选择归还
5. 用户也可以在任何时候取消操作
6. 用户可以查看自己的借阅历史。
7. 借阅期限将至时，系统会向借阅者发送借阅即将到期通知
8. 对超出借阅期限的书籍，系统也会请求扣去借阅者的超期费

通过部署该系统，图书馆可以提高工作效率，减轻工作人员负担，同时方便学校师生完全自助获取图书资源，有效管理借阅情况，减少出现过期等问题。

与类似声明一致的陈述可能包括要求与现有图书管理系统集成或遵守校园政策和规定关于借还书的要求。

## Product perspective

**Define the system's relationship to other related products. 定义系统与其他相关产品的关系。**

If the product is an element of a larger system, relate the requirements of that larger system to the functionality of the product covered by the SRS.

If the product is an element of a larger system, identify the **interfaces** between the product covered by the SRS and the larger system of which the product is an element.

Consider a block diagram showing the major elements of the larger system, interconnections and external interfaces.

Describe how the software operates within the following constraints:

a) system interfaces;

**b) user interfaces; 用户接口**

**c) hardware interfaces; 硬件接口**

**d) software interfaces; 软件接口**

**e) communications interfaces; 通信接口**

f) memory;

g) operations;

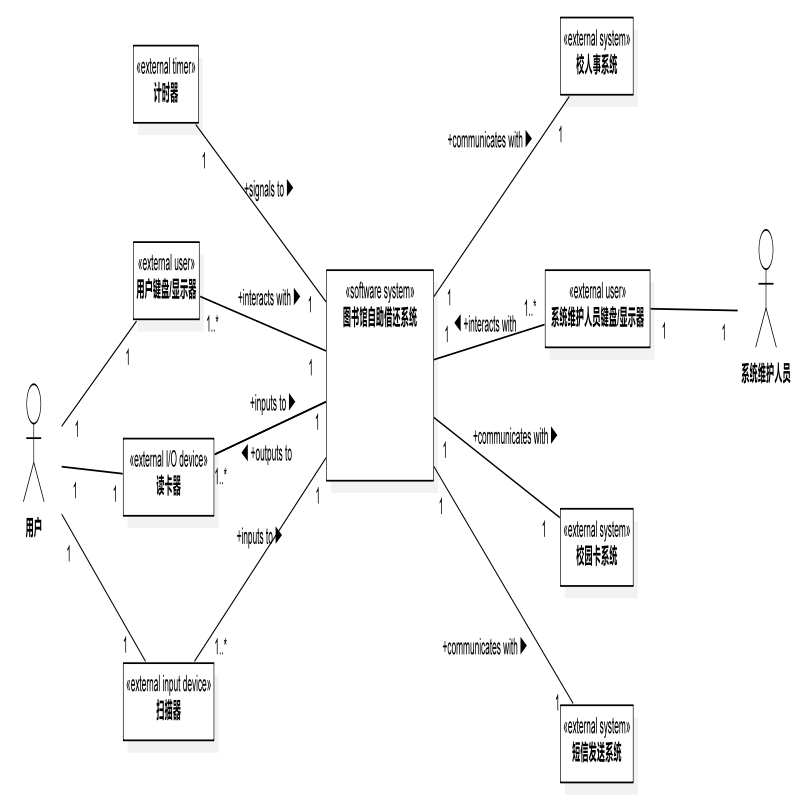
h) site adaptation requirements; and

**i) interfaces with services. 服务接口**

可将【**软件系统上下文类图】**放置在这里！包括简要的描述和分析。

需要填写的具体内容即下面的1.3.1-1.3.4小节。

为了定义我们的图书馆自助借还系统与其他类的关系，我们采用软件系统上下文类图的方法进行描述与分析。软件系统上下文类图见下：

为了更加清晰地描述，我们将

### User interfaces

**Specify the logical characteristics of each interface between the software product and its users.**

NOTE A **style guide** for the user interface can provide consistent rules for organization, coding and

interaction of the user with the system. 与用户的接口的逻辑特征

【示例】PC-based user interface: This interface provides authorized users to access the software system. The **GUI** provides menus, buttons, input boxes, selection boxes, and forms. Users can manage the system by adjusting speed limits, viewing monthly and quarterly reports, and updating personal information such as “phone number” and “address” based on their identity.

Mobile-based user interface: This interface is similar to the PC-based interfaces, but allows for mobile access to the backend management system from authorized devices.

可放置**【GUI界面】**在这里！

### Hardware interfaces

**Specify the logical characteristics of each interface between the software product and the hardware elements of the system.** This includes configuration characteristics (number of ports, instruction sets, etc.). It also covers such matters as what devices are to be supported, how they are to be supported, and protocols. For example, terminal support may specify full-screen support as opposed to line-by-line support.

【示例】Vehicle speed detection sensor interface: The software should be capable of receiving data from multiple vehicle speed detection sensors.

Vehicle speed display interface: The software should be able to display the speed and whether the speed is exceeded by vehicle speed display units.

PC and Mobile device interface: The software should be able to access the backend server through both mobile devices and personal computers.

### Software interfaces

**Specify the use of other required software products (e.g., a data management system, an operating system, or a mathematical package), and interfaces with other application systems (e.g., the linkage between an accounts receivable system and a general ledger system).**

**指定其他所需软件产品(例如数据管理系统、操作系统或数学软件包)的使用，以及与其他应用系统的接口(例如应收帐款系统和总帐系统之间的连接)。**

For each required software product, specify: like 数据库软件

a) name;

b) mnemonic; 助记符

c) specification number; 规格号

d) version number; 版本号

e) source. 源

NOTE It is acceptable to specify required platforms or operating systems, but rarely feasible to require a specific version. Typically, a version number most recent version or any currently maintain version can be specified for software.

注意: 指定所需的平台或操作系统是可以接受的，但要求特定版本却很少可行。通常，可以为软件指定最新版本或任何当前维护版本的版本号。

For each interface, specify: 描述消息内容和消息接口

1. discussion of the purpose of the interfacing software as related to this software product;

讨论与该软件产品相关的接口软件的目的

1. definition of the interface in terms of message content and format. It is not necessary to detail any well-documented interface, but a reference to the document defining the interface is required.

根据消息内容和格式定义接口。不需要详细说明任何文档化良好的接口，但是需要引用定义接口的文档。

【示例】Interface to SMS System: 短讯系统接口

1. Purpose: To send SMS notifications to drivers who exceed the safe speed limit.

用途: 向超速驾驶的司机发送短讯通知。

1. Message content: SMS messages containing notification of speeding violations and educational messages regarding safe driving practices.

讯息内容: 载有超速驾驶通知及有关安全驾驶的教育讯息的短讯。

Interface to Campus Employee Information System: 校园员工信息系统接口

1. Purpose: To get employee information.

用途: 获取员工信息。

1. Message content: Requests for employee information.

信息内容: 要求提供员工信息

可添加如下软件产品:

Operating System

a) Name: Linux

b) Specification number: POSIX

c) Version number: CentOS 6.5

d) Source: Open source

Data Management System

a) Name: MySQL

b) Version number: 5.2.7

c) Source: Open source

校人事系统

1. 用途：获取借阅者的电话号码以发送借阅即将到期通知
2. 信息内容：要求提供对应借阅者电话号码

校园卡系统

1. 用途：
2. 验证校园卡没有被挂失
3. 对于超过借阅期限的书籍，对相应借阅者的校园卡账户中扣除 1 元超期费
4. 信息内容：
5. 要求提供校园卡挂失状态
6. 要求对相应借阅者的校园卡账户中扣除 1 元超期费

短信发送系统

1. 用途：对借阅者发送借阅即将到期通知
2. 信息内容：对借阅者相应电话号码发送包含借阅到期提示和对应借阅记录讯息的短讯

### Communications interfaces

Specify the various interfaces to communications such as local network protocols. 通信协议

本系统中没有特别指定，下面仅供参考: **// e.g., SYSU-Secure校园网**

【示例】Local Network Protocols: This interface enables the communication between the software system and other systems on the local network, such as the vehicle registration system or employee information system.

本地网络协议: 这个接口允许软件系统与本地网络上的其他系统(如车辆登记系统或员工信息系统)进行通信。

SYSU-Secure校园网

该校园局域网允许自助借还机连接到一个中央服务器上，以此来进行自助借还机客户端与自助借还服务端的通信。

## Product functions

**Provide a summary of the major functions that the software will perform.** For example, an SRS for an accounting program may use this part to address customer account maintenance, customer statement and invoice preparation **without mentioning the vast amount of detail that each of those functions requires**. Sometimes the function summary that is necessary for this part can be taken directly from the section of the higher-level specification (if one exists) that allocates particular functions to the software product. 提供软件将要执行的主要功能的摘要。例如，会计程序的 SRS 可以使用这一部分来处理客户账户维护、客户报表和发票准备，而不必提及每个功能所需的大量细节。有时候，这个部分所需要的功能摘要可以直接取自为软件产品分配特定功能的高级规范(如果存在的话)部分。

**Use cases**, user stories, and scenarios are also used to describe product functions.用例、用户描述和场景也用于描述产品功能。

Note that for the sake of clarity:

a) the product functions should be organized in a way that makes the list of functions understandable to the acquirer or to anyone else reading the document for the first time.产品功能的组织方式应使得购买者或第一次阅读文件的任何人都能理解产品功能列表。

b) textual or **graphical methods** can be used to show the different functions and their relationships. Such a **diagram** is not intended to show a design of a product, but simply shows the logical relationships among variables.文字或图形方法可用以显示不同的函数及其关系。这样的图表并不打算显示产品的设计，而只是显示变量之间的逻辑关系。

【示例】Speed monitoring: The software will monitor the speed of vehicles passing through key locations within the campus.速度监控: 该软件将监控车辆通过校园内关键地点的速度。

Detection of over-speeding: The software will detect vehicles that exceed the safe speed limit and flag them for further action.超速检测: 该软件将检测超过安全速度限制的车辆，并标记它们以采取进一步行动。

Storing detection records: The software will store the detection records including the license plate number, time of detection, location, and speed in the system.存储检测记录: 软件将包括车牌号、检测时间、位置和速度在内的检测记录存储在系统中。

Sending SMS notifications: The software will send SMS notifications to the driver of the over-speeding vehicle or the responsible authority of the driver's department as per the settings configured in the backend management system.发送短信通知: 该软件将发送短信通知给超速行驶的车辆的司机或司机部门的负责人，根据设置配置在后端管理系统。

Managing authorized users: The software will allow only authorized users from the campus security department to access the backend management system, which can be accessed through both PC and mobile devices.管理授权用户: 该软件只允许校园安全部门的授权用户访问后端管理系统，后端管理系统可以通过个人电脑和移动设备访问。

Reporting and statistics: The software will generate monthly and quarterly reports of over-speeding incidents and provide the ability to view detailed records of vehicles, drivers, and locations.报告和统计: 该软件将生成每月和每季度的超速事件报告，并提供查看详细记录的车辆，司机和地点的能力。

Configuration and customization: The software will provide the campus security department with the ability to configure the safe speed limit, over-speeding thresholds for SMS notifications, and manage user accounts.配置和定制: 该软件将为校园安全部门提供配置安全速度限制、短信通知超速阈值和管理用户帐户的能力。

将**【用例建模】**放在这里！

## User characteristics

**Describe those general characteristics of the intended groups of users of the product including characteristics that may influence usability, such as educational level, experience, disabilities, and technical expertise.** This description should not state-specific requirements, but rather should state the reasons why certain specific requirements are later specified in specific requirements in 9.6.9. 描述用户的特征(影响其使用系统) ----> 方便撰写用户手册、说明书等

【示例】The intended groups of users of the product are mainly the authorized personnel of the campus security department, including officials and ordinary staff members. They should have basic computer skills and knowledge of operating a web-based system.

## Definitions

Provide definitions for any words or phrases that have special meanings beyond normal dictionary

definitions. 特殊词汇的定义

【示例】Campus Speed Monitoring System: A software system designed to monitor the speed of vehicles in a campus environment and identify vehicles that exceed the defined safe speed limit. Also, it provides administrative functions, including data storage, user management, and configuration management.

## Acronyms and Abbreviations

Spell out or define all acronyms and abbreviations used in the documents.

NOTE This information can be provided by reference to one or more appendixes in the documents or by

reference to other documents. 缩写词定义

【示例】PC: Personal Computer

SMS: Short Message Service

# Requirements

## External interfaces

[此部分非必需，可删去！]

**Define all inputs into and outputs from the software system.** The description should complement the interface descriptions in 9.6.4.1 through 9.6.4.5, and should not repeat information there.

Each interface defined should include the following content:

a) name of item;

b) description of purpose;

c) source of input or destination of output;

d) valid range, accuracy and/or tolerance;

e) units of measure;

f) timing;

g) relationships to other inputs/outputs;

h) data formats;

i) command formats; and

j) data items or information included in the input and output.

定义每个接口的详细信息

【示例】Vehicle Speed Detector Interface:

**a) Purpose**: Detects the speed of vehicles passing through key points in the campus

**b) Source/Destination**: Inputs from passing vehicles, outputs to the Speed Display and Back-end Management System

**c) Valid Range/Accuracy/Tolerance**: Should accurately detect speeds up to 100 km/h with an accuracy of at least +/- 5 km/h

**d) Units of measure**: Kilometers per hour (km/h)

**3) Timing**: Real-time

**4) Relationships to other inputs/outputs**: Outputs data to the Speed Display and Management System

**5) Data formats**: Digital signal

**6) Command formats**: N/A

**7) Data items or information included in the input**: Vehicle speed, detection time, location

SMS System Interface:

Purpose: Send SMS messages to drivers who exceed the campus speed limit and to notify authorized personnel of temporary vehicles entering the campus.

Source/Destination: Inputs from the Backend Management System, outputs to drivers

Valid Range/Accuracy/Tolerance: N/A

Units of measure: N/A

Timing: Real-time and scheduled (monthly and quarterly reports)

Relationships to other inputs/outputs: Receives data from the management system, outputs data to SMS Sending System

Data formats: Text message

Command formats: N/A

Data items or information included in the input and output: Driver information, violation information, approved vehicle information, messages for warning education and notification

## Functions

**Define the fundamental actions that have to take place in the software in accepting and processing the inputs and in processing and generating the outputs**

**定义软件在接受和处理输入以及处理和生成输出时必须采取的基本行动**

including:

**a) validity checks on the inputs;检查输入的有效性**

**b) exact sequence of operations;操作的准确次序**

**c) responses to abnormal situations**,对异常情况的反应

including:

1) overflow;溢流

2) communication facilities;通讯设施

3) hardware faults and failures; 硬件故障和故障

4) error handling and recovery;错误处理及修复

d) effect of parameters;参数的影响

e) relationship of outputs to inputs, including:产出与投入的关系

1) input/output sequences; 输入/输出序列

2) formulas for input-to-output conversion.输入输出转换公式

It may be appropriate to partition the functional requirements into sub-functions or sub-processes.

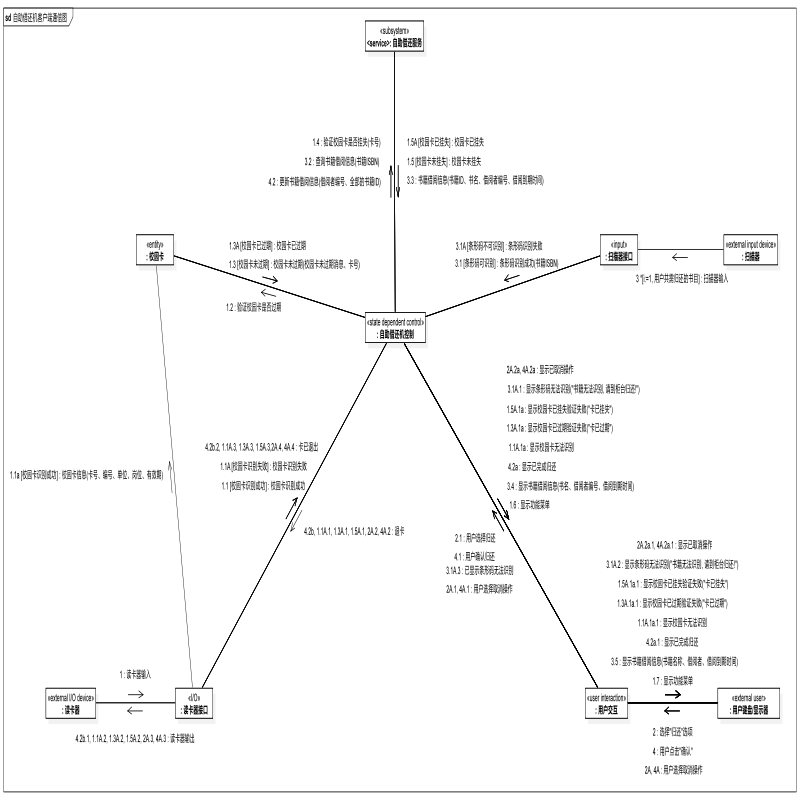
This does not imply that the software design will also be partitioned that way.

将功能需求划分为子函数或子流程可能是合适的。这并不意味着软件设计也将按照这种方式进行分区。

将**【动态交互建模】**放在这里！

**归还用例动态交互建模**

1 客户端动态交互建模

****

1.1客户端动态交互消息序列

1："用户"参与者将校园卡插入"读卡器"。"读卡器接口"对象读取卡中信息

1.1：校园卡识别成功，"读卡器接口"将"校园卡识别成功"的消息发送给"自助借还机控制"对象，使得"自助借还机控制"状态图从"空闲状态(初始状态)"转移到"验证校园卡未过期"状态。与该转移关联的输出事件是"验证校园卡是否过期"

1.1a：校园卡识别成功，"读卡器接口"将校园卡输入数据(包含了卡号、编号、单位、岗位、有效期)发送给"校园卡"实体对象

1.2："自助借还机控制"将"验证校园卡是否过期"消息发送给"校园卡"对象

1.3：若校园卡未过期，"校园卡"对象将"校园卡未过期"消息(包含校园卡未过期消息、卡号)发送给"自助借还机控制"对象，使得"自助借还机控制"状态图从"验证校园卡未过期"转移到"验证校园卡未挂失"状态。与该转移关联的输出事件是"验证校园卡是否挂失"

1.4："自助借还机控制"向"自助借还服务"发送一个"验证校园卡是否挂失"(包含卡号)的请求

1.5："自助借还服务"验证校园卡未挂失并向"自助借还机控制"发送"校园卡未挂失"的响应，使得"自助借还机控制"状态图从"验证校园卡未挂失"转移到"等待用户选择功能"状态。与该转移关联的输出事件是"显示功能菜单"

1.6, 1.7："自助借还机控制"对象通过"用户交互"对象向"用户键盘/显示器"对象发送"显示功能菜单"消息，将功能菜单显示给用户

2, 2.1："用户"参与者输入"归还"选项，通过"用户交互"对象将"用户选择归还"发送给"自助借还机控制"，使得"自助借还机控制"状态图从"等待用户选择功能"转移到"等待书籍识别"状态。

3\*[i:=1, 用户共需归还的书目]："用户"参与者将每本书籍的条形码置于自助借还机的"扫描器"下，"扫描器接口"对象获取书籍信息

3.1：条形码可识别，"扫描器接口"将"条形码识别成功"的消息(包含书籍ISBN)发送给"自助借还机控制"对象，使得"自助借还机控制"状态图从"等待书籍识别"转移到"查询书籍借阅信息"状态。与该转移关联的输出事件是"查询书籍借阅信息"

3.2："自助借还机控制"向"自助借还服务"发送一个"查询书籍借阅信息"(包含书籍ISBN)的请求

3.3："自助借还服务"查询完毕，向"自助借还机控制"发送"书籍借阅信息"的响应(包含书籍ID、书名、借阅者编号、借阅到期时间)，使得"自助借还机控制"状态图从"查询书籍借阅信息"转移到"等待书籍识别"状态。与该转移关联的输出事件是"显示书籍借阅信息"

3.4, 3.5："自助借还机控制"对象通过"用户交互"对象向"用户键盘/显示器"对象发送"显示书籍借阅信息"消息(包含书名、借阅者编号、借阅到期时间)，将书籍借阅信息显示给用户

4："用户"参与者向"用户交互"对象输入"确认"选项

4.1："用户交互"对象将"用户确认归还"发送给"自助借还机控制"，使得"自助借还机控制"状态图从"等待书籍识别"转移到"确认完成归还"状态。与该转移关联的输出事件是"更新书籍借阅信息"、"退卡"和"显示已完成归还"

4.2："自助借还机控制"向"自助借还服务"发送一个"更新书籍借阅信息"(包含借阅者编号、全部的书籍ID)的请求

4.2a, 4.a.1："自助借还机控制"对象通过"用户交互"对象向"用户键盘/显示器"对象发送"显示已完成归还"消息，提示用户已完成归还操作

4.2b, 4.2b.1："自助借还机控制"通过"读卡器接口"向"读卡器"外部I/O设备输出"退卡"消息，完成退卡

4.2b.2："读卡器接口"向"自助借还机控制"发送"卡已退出"消息，使得"自助借还机控制"从"确认完成归还"重新回到"空闲状态"状态。

1.1A：校园卡识别失败，"读卡器接口"将"校园卡识别失败"的消息发送给"自助借还机控制"对象，使得"自助借还机控制"状态图从"空闲状态(初始状态)"转移到"退卡"状态。与该转移关联的输出事件是"退卡"和"显示校园卡无法识别"

1.1A.1, 1.1A.2, 1.1A.1a, 1.1A.1a.1: "自助借还机控制"通过"读卡器接口"向"读卡器"外部I/O设备输出"退卡"消息，完成退卡。与此同时，"自助借还机控制"对象通过"用户交互"对象向"用户键盘/显示器"对象发送"显示校园卡无法识别"消息，提示用户校园卡无法识别

1.1A.3："读卡器接口"向"自助借还机控制"发送"卡已退出"消息，使得"自助借还机控制"从"退卡"重新回到"空闲状态"状态。

1.3A：若校园卡已过期，"校园卡"对象将"校园卡已过期"消息发送给"自助借还机控制"对象，使得"自助借还机控制"状态图从"验证校园卡未过期"转移到"退卡"状态。与该转移关联的输出事件是"退卡"和"显示校园卡已过期验证失败"

1.3A.1, 1.3A.2, 1.3A.1a, 1.3A.1a.1: "自助借还机控制"通过"读卡器接口"向"读卡器"外部I/O设备输出"退卡"消息，完成退卡。与此同时，"自助借还机控制"对象通过"用户交互"对象向"用户键盘/显示器"对象发送"显示校园卡已过期验证失败"(包含"卡已过期")消息，提示用户校园卡已过期

1.3A.3："读卡器接口"向"自助借还机控制"发送"卡已退出"消息，使得"自助借还机控制"从"退卡"重新回到"空闲状态"状态。

1.5A："自助借还服务"验证校园卡已挂失并向"自助借还机控制"发送"校园卡已挂失"的响应，使得"自助借还机控制"状态图从"验证校园卡未挂失"转移到"退卡"状态。与该转移关联的输出事件是"退卡"和"显示校园卡已挂失验证失败"

1.5A.1, 1.5A.2, 1.5A.1a, 1.5A.1a.1: "自助借还机控制"通过"读卡器接口"向"读卡器"外部I/O设备输出"退卡"消息，完成退卡。与此同时，"自助借还机控制"对象通过"用户交互"对象向"用户键盘/显示器"对象发送"校园卡已挂失验证失败"(包含"卡已挂失")消息，提示用户校园卡已挂失

1.5A.3："读卡器接口"向"自助借还机控制"发送"卡已退出"消息，使得"自助借还机控制"从"退卡"重新回到"空闲状态"状态。

3.1A：条形码不可识别，"扫描器接口"将"条形码识别失败"的消息发送给"自助借还机控制"对象，使得"自助借还机控制"状态图从"等待书籍识别"转移到"提示条形码无法识别"状态。与该转移关联的输出事件是"显示条形码无法识别"

3.1A.1, 3.1A.2: "自助借还机控制"通过"读卡器接口"向"读卡器"外部I/O设备输出"退卡"消息，完成退卡。与此同时，"自助借还机控制"对象通过"用户交互"对象向"用户键盘/显示器"对象发送"显示条形码无法识别"(包含"书籍无法识别, 请到柜台归还!")消息，提示用户书籍条形码无法识别，需要到柜台归还

3.1A.3："用户交互"向"自助借还机控制"发送"已显示条形码无法识别"消息，使得"自助借还机控制"从"提示条形码无法识别"重新回到"等待书籍识别"状态。

2A, 2A.1："用户"参与者选择取消操作，通过"用户交互"对象将"用户选择取消操作"发送给"自助借还机控制"，使得"自助借还机控制"状态图从"等待用户选择功能"转移到"退卡"状态。与该转移关联的输出事件是"退卡"和"显示已取消操作"

2A.2, 2A.3, 2A.2a, 2A.2a.1: "自助借还机控制"通过"读卡器接口"向"读卡器"外部I/O设备输出"退卡"消息，完成退卡。与此同时，"自助借还机控制"对象通过"用户交互"对象向"用户键盘/显示器"对象发送"显示已取消操作"消息，提示用户已取消功能操作

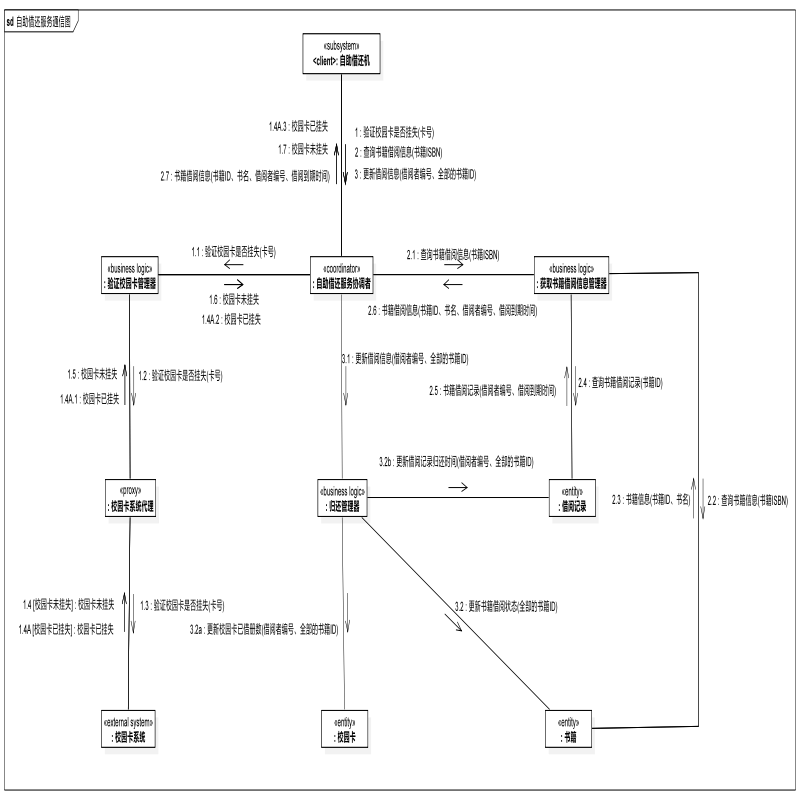
2A.4："读卡器接口"向"自助借还机控制"发送"卡已退出"消息，使得"自助借还机控制"从"退卡"重新回到"空闲状态"状态。

4A, 4A.1："用户"参与者选择取消操作，通过"用户交互"对象将"用户选择取消操作"发送给"自助借还机控制"，使得"自助借还机控制"状态图从"等待书籍识别"转移到"退卡"状态。与该转移关联的输出事件是"退卡"和"显示已取消操作"

4A.2, 4A.3, 4A.2a, 4A.2a.1: "自助借还机控制"通过"读卡器接口"向"读卡器"外部I/O设备输出"退卡"消息，完成退卡。与此同时，"自助借还机控制"对象通过"用户交互"对象向"用户键盘/显示器"对象发送"显示已取消操作"消息，提示用户已取消功能操作

4A.4："读卡器接口"向"自助借还机控制"发送"卡已退出"消息，使得"自助借还机控制"从"退卡"重新回到"空闲状态"状态。

2 服务端动态交互建模

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2.1 服务端动态交互消息序列

1, 1.1, 1.2, 1.3："自助借还机"向"自助借还服务协调者"发送一个"验证校园卡是否挂失"(包含卡号)的请求，"自助借还服务协调者"根据输入决策将请求转向"验证校园卡管理器"。"验证校园卡管理器"通过"校园卡系统代理"向"校园卡系统"外部系统发送"验证校园卡是否挂失"(包含卡号)的请求

1.4, 1.5, 1.6, 1.7：若校园卡未挂失，则"校园卡系统"外部系统将"校园卡未挂失"的消息通过"校园卡系统代理"发送给"验证校园卡管理器"，再由它经过"自助借还服务协调者"将"校园卡未挂失"的消息响应给"自助借还机"客户端

2, 2.1："自助借还机"向"自助借还服务协调者"发送一个"查询书籍借阅信息"(包含书籍ISBN)的请求，"自助借还服务协调者"根据输入决策将请求转向"获取书籍借阅信息管理器"。

2.2, 2.3："获取书籍借阅信息管理器"向"书籍"实体对象请求"查询书籍信息"(包含书籍ISBN)，"书籍"实体对象向其返回"书籍信息"(包含书籍ID、书名)

2.4, 2.5："获取书籍借阅信息管理器"向"借阅记录"实体对象请求"查询书籍借阅记录"(包含书籍ID)，"借阅记录"实体对象向其返回"书籍借阅记录"(包含借阅者编号、借阅到期时间)

2.6, 2.7："获取书籍借阅信息管理器"通过"自助借还服务协调者"将"书籍借阅信息"(包含书籍ID、书名、借阅者编号、借阅到期时间)的消息响应给"自助借还机"客户端

3, 3.1："自助借还机"向"自助借还服务协调者"发送一个"更新借阅信息"(包含借阅者编号、全部的书籍ID)的请求，"自助借还服务协调者"根据输入决策将请求转向"归还管理器"。

3.2："归还管理器"向"书籍"实体对象发送"更新书籍借阅状态"(包含全部的书籍ID)的消息。每条书籍ID对应的"书籍"实体对象的借阅状态将变为"已归还"

3.2a："归还管理器"向"校园卡"实体对象发送"更新校园卡已借册数"(包含借阅者编号、全部的书籍ID)的消息。借阅者编号对应的"校园卡"实体对象的已借册数将减去书籍ID的总条数

3.2b："归还管理器"向"借阅记录"实体对象发送"更新借阅记录归还时间"(包含借阅者编号、全部的书籍ID)的消息。借阅者编号和每条书籍ID对应的所有"借阅记录"实体对象的归还时间记录为当前系统时间

1.4A, 1.A.1, 1.A.2, 1.A.3：若校园卡已挂失，则"校园卡系统"外部系统将"校园卡已挂失"的消息通过"校园卡系统代理"发送给"验证校园卡管理器"，再由它经过"自助借还服务协调者"将"校园卡已挂失"的消息响应给"自助借还机"客户端

## Performance requirements

Specify both the static and the dynamic numerical requirements placed on the software or on human interaction with the software as a whole.

非功能性需求

Static numerical requirements may include the following:

a) the number of terminals to be supported;

b) the number of simultaneous users to be supported; and

c) the amount and type of information to be handled.

Static numerical requirements are sometimes identified under a separate section entitled Capacity. Dynamic numerical requirements may include, for example, the number of transactions and tasks and the amount of data to be processed within certain time periods for both normal and peak workload conditions.

The performance requirements should be stated in measurable terms.

For example,

95 % of the transactions shall be processed in less than 1 s.

rather than,

*An operator shall not have to wait for the transaction to complete.*

NOTE Numerical limits applied to one specific function are normally specified as part of the processing subparagraph description of that function.

## Logical database requirements

Specify the logical requirements for any information that is to be placed into a database, including:

逻辑数据库需求是指规定将要放入数据库中的任何信息的逻辑要求

a) types of information used by various functions;不同功能使用的信息类型

b) frequency of use; 使用频率

c) accessing capabilities;访问能力

**d) data entities and their relationships;数据实体及其关系**

e) integrity constraints;完整性约束

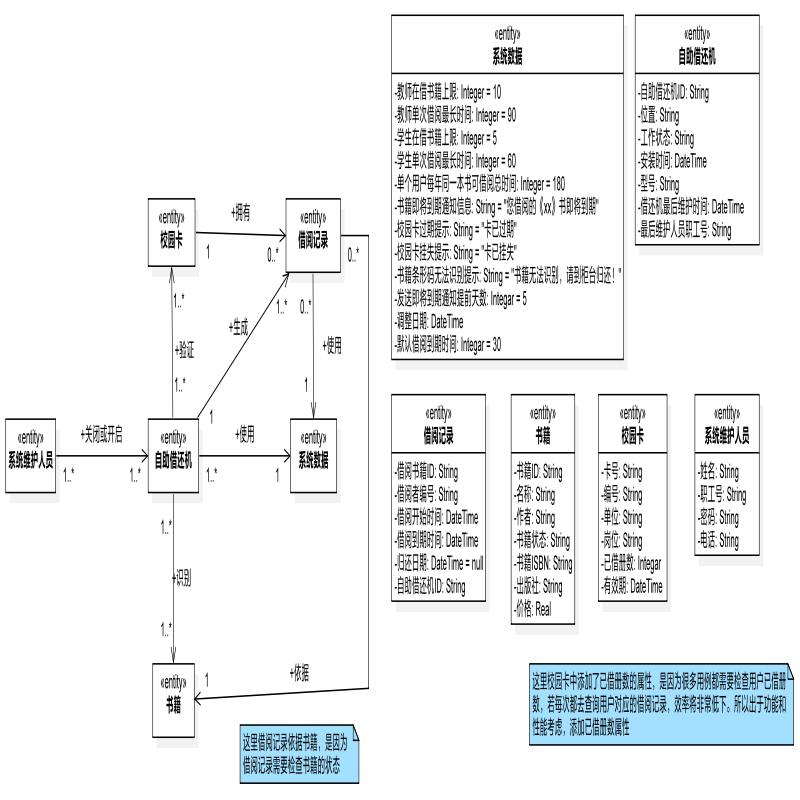
f) security; 安全性

**g) data retention requirements.****数据保留需求**

**数据库内容**

将**【实体类建模】**放在这里！

为了描述逻辑数据库的需求，我们采用实体类建模的方式进行分析。实体类建模如下图：

****

可以看到，我们根据系统用例需求提取出了六个实体类，他们分别为：“系统数据”实体类、“自助借还机”实体类、“借阅记录”实体类、“书籍”实体类、“校园卡”实体类以及“系统维护人员”实体类。这些数据实体的属性和他们之间的关系在图中已有体现，这里就不再赘述。

另外，逻辑数据库存在着一些数据保留需求。对“校园卡实体类”，我们并不需要将“卡号、岗位、有效期”存入数据库中，只需要在自助借还机中使用，无需保留。而为了让我们查看用户已借册数时，无需遍历借阅记录，“校园卡”实体类中的“已借册数”是需要存入服务端数据库之中的。而为了识别用户的身份(老师或学生)来决定可借册数、单次借阅最长时间和在相关借阅记录中查找信息，我们也需要在服务端数据库之中存储“岗位”与“编号”。

对其它实体类的其他属性，全部均需保留。

## Standards compliance

Specify the requirements derived from existing standards or regulations, including:

**a) report format;**

**b) data naming;**

c) accounting procedures; and

d) audit tracing.

行业标准、兼容性问题

For example, this could specify the requirement for software to trace processing activity. Such traces are needed for some applications to meet minimum regulatory or financial standards. An audit trace requirement may, for example, state that all changes to a payroll database shall be recorded in a trace file with before and after values.

## Software system attributes

软件系统属性

Specify the required attributes of the software product. The following is a partial list of examples:

a) **Reliability** - specify the factors required to establish the required reliability of the software system at the time of delivery. 可靠性

b) **Availability** - specify the factors required to guarantee a defined availability level for the entire system such as checkpoint, recovery and restart. 可行性

c) **Security** - specify the requirements to protect the software from accidental or malicious access, use modification, destruction, or disclosure. Specific requirements in this area could include the need to: 安全性

1) utilize certain cryptographic techniques;

2) keep specific log or history data sets;

3) assign certain functions to different modules;

4) restrict communications between some areas of the program;

5) check data integrity for critical variables; and

6) assure data privacy.

d) **Maintainability** - specify attributes of software that relate to the ease of maintenance of the software itself. These may include requirements for certain modularity, interfaces, or complexity limitation. Requirements should not be placed here just because they are thought to be good design practices.

可维护性

e) **Portability** - specify attributes of software that relate to the ease of porting the software to other

host machines and/or operating systems, including:

可扩展性

1) percentage of elements with host-dependent code;

2) percentage of code that is host dependent;

3) use of a proven portable language;

4) use of a particular compiler or language subset; and

5) use of a particular operating system.

# Supporting information

Additional supporting information to be considered includes:

1. **sample input/output formats, descriptions of cost analysis studies, or results of user surveys;**

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b) supporting or background information that can help the readers of the SRS;

**c) a description of the problems to be solved by the software**; and

d) special packaging instructions for the code and the media to meet security, export, initial loading

or other requirements.

The SRS should explicitly state whether or not these information items are to be considered part of the requirements.

可不写

# References

Include the following information regarding references:

**a) provide a complete list of all documents referenced elsewhere;**

b) identify each document by title, report number (if applicable), date, and publishing organization; and

c) specify the sources from which the references can be obtained.

[1] ISO/IEC/IEEE 29148:2018(E)

- 1 介绍

- 1.1 开发目的(已完成)

- 1.2 产品梗概(已完成)

- 1.3 产品接口 ---> 软件系统上下文类图

- 1.3.1 用户接口 🡪 GUI界面(已完成)

- 1.3.2 硬件接口(已完成)

- 1.3.3 软件接口(已完成)

- 1.3.4 通信接口(已完成)

- 1.4 产品功能 ---> 用例建模 每个人写自己的部分🡪 栩彬

- 1.5 用户特征🡪栩彬

- 1.6 特殊词汇🡪 刘洋

- 1.7 缩写词定义🡪 刘洋

- 2 要求

- 2.1 外部接口🡪 刘洋

- 2.2 功能 ---> 动态交互建模 每个人写自己的部分🡪 开钰

- 2.3 非功能性需求🡪 刘洋

- 2.4 数据库 ---> 实体类建模(已完成)

- 2.5 行业标准🡪 刘洋

- 2.6 软件系统属性 🡪 刘洋

- 3 支持信息 🡪 开钰

- 4 参考资料(已完成)