Modeling and Simulation of Power Electronics Converters

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Simulation content:

1. **Modeling and simulation of buck circuit in CCM mode**
2. Modeling and simulation of three-phase voltage source PWM inverter

$$L\frac{d\hat{i}(t)}{dt} = -DR_g\hat{i}(t) - \hat{v}(t) + D\hat{v}_g(t) + (V_g - R_g I)\hat{d}(t)$$

$$C\frac{d\hat{v}(t)}{dt} = \hat{i}(t) - \frac{1}{R}\hat{v}(t)$$

$$i_g(t) = D\hat{i}(t) + I\hat{d}(t)$$

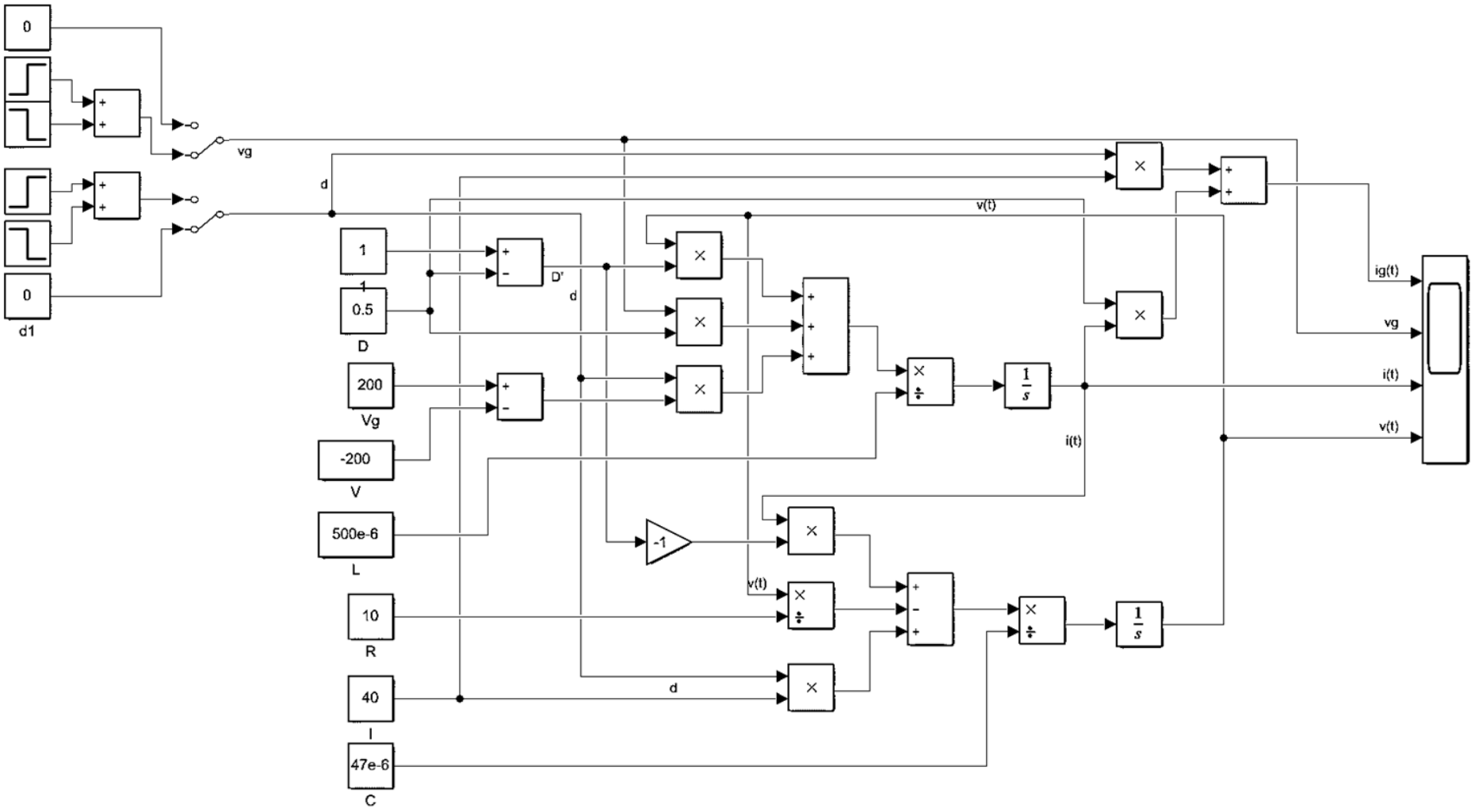
1. Modeling and simulation of buck-boost circuit in CCM mode

The small signal AC model of buck-boost converter is as follows

$$L\frac{d\hat{i}(t)}{dt} = D\hat{v}(t) + D'\hat{v}(t) + (V_g - V)\hat{d}(t)$$

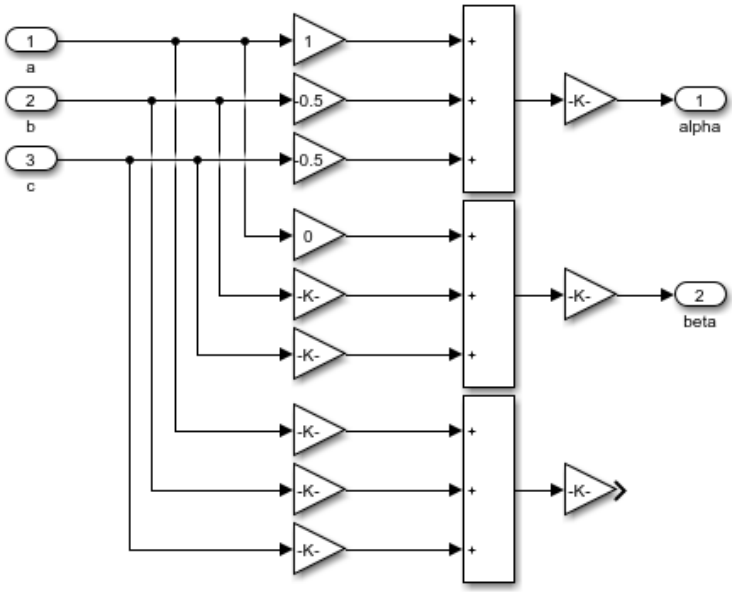
$$C\frac{d\hat{v}(t)}{dt} = -D'\hat{i}(t) - \frac{\hat{v}(t)}{R} + I\hat{d}(t)$$

$$\hat{i}_g(t) = D\hat{i}(t) + I\hat{d}(t)$$

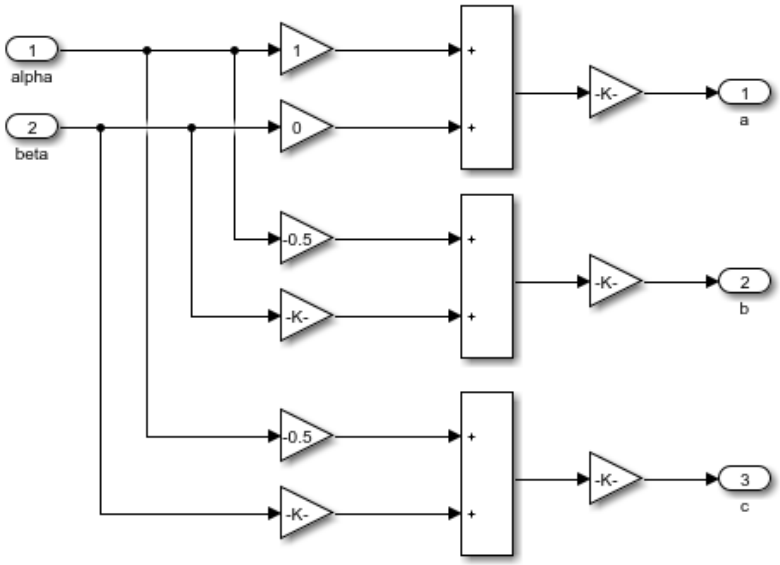

0
d1
vg
d
1
1
0.5
D
D'
d
200
Vg
-200
V
500e-6
L
10
R
40
I
47e-6
C
-1
v(t)
i(t)
ig(t)
vg
i(t)
v(t)

3. Modeling and simulation of three-phase voltage source PWM inverter

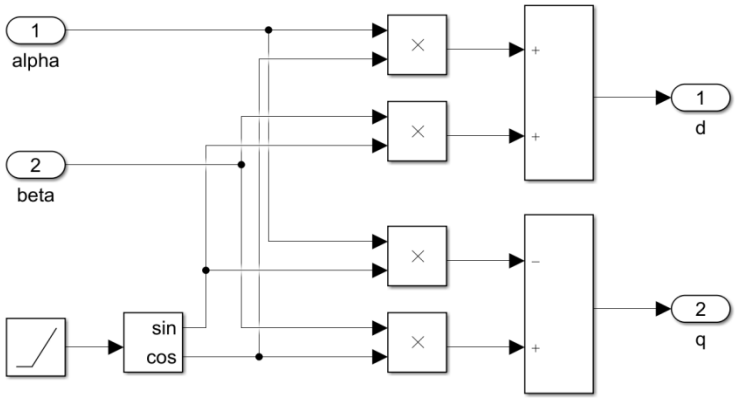
$$
\begin{cases}
\dfrac{d}{dt}\begin{bmatrix} < i_d >_{T_S} \\ < i_q >_{T_S} \end{bmatrix} = -\dfrac{1}{3L}\begin{bmatrix} < v_d >_{T_S} \\ < v_q >_{T_S} \end{bmatrix} - \begin{bmatrix} 0 & -\omega \\ \omega & 0 \end{bmatrix} \cdot \begin{bmatrix} < i_d >_{T_S} \\ < i_q >_{T_S} \end{bmatrix} + \dfrac{1}{3L}\begin{bmatrix} d_d \\ d_q \end{bmatrix} \cdot < v_{dc} >_{T_S} \\
\dfrac{d}{dt}\begin{bmatrix} < v_d >_{T_S} \\ < v_q >_{T_S} \end{bmatrix} = \dfrac{1}{C}\begin{bmatrix} < i_d >_{T_S} \\ < i_q >_{T_S} \end{bmatrix} - \begin{bmatrix} 0 & -\omega \\ \omega & 0 \end{bmatrix} \cdot \begin{bmatrix} < v_d >_{T_S} \\ < v_q >_{T_S} \end{bmatrix} - \dfrac{1}{RC}\begin{bmatrix} < v_d >_{T_S} \\ < v_q >_{T_S} \end{bmatrix} \\
< i_{dc} >_{T_S} = \begin{bmatrix} d_d & d_q \end{bmatrix} \cdot \begin{bmatrix} < i_d >_{T_S} \\ < i_q >_{T_S} \end{bmatrix}
\end{cases}
$$



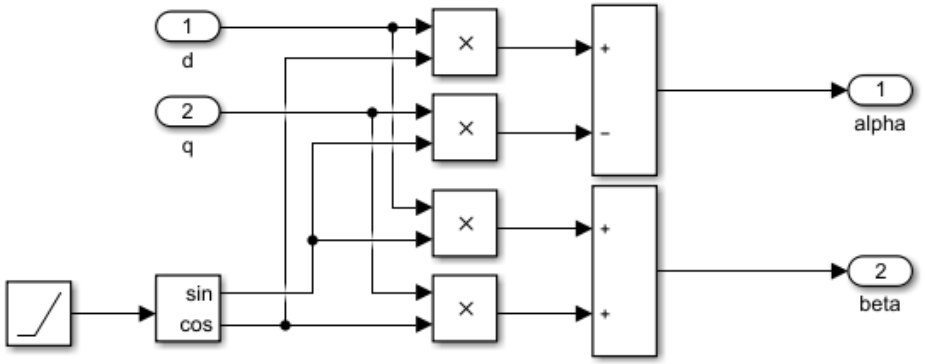
(a) Clark transform simulation diagram



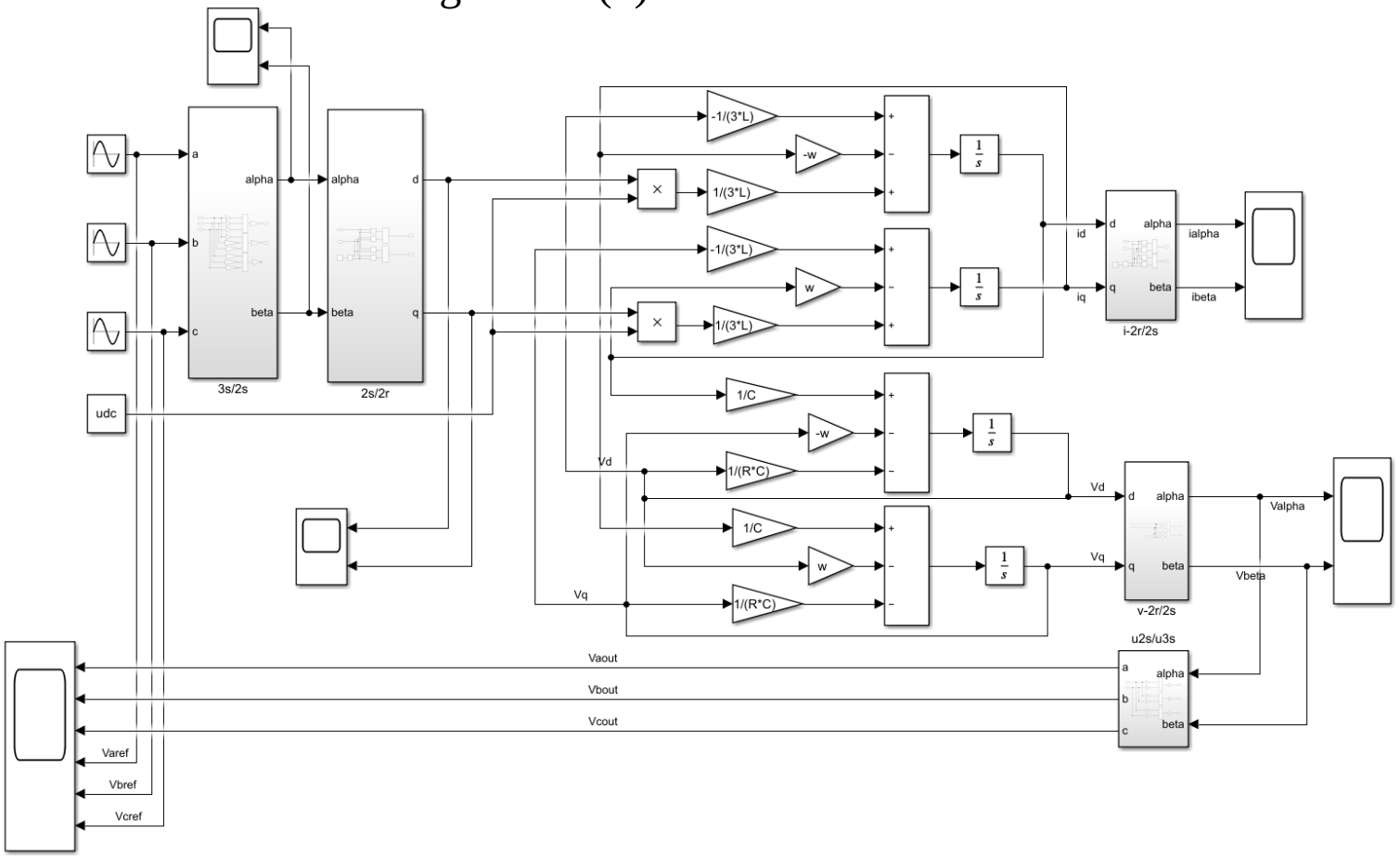
(b) Clark inverse transformation simulation diagram



(a) Park transform simulation diagram



(b) Park inverse transformation simulation diagram



英文实验报告要求

1月17日上交
全英文电子稿报告+仿真模型
jiangyongkai@zjut.edu.cn

要素：

- 标题：
- 作者：姓名、班级、学号
- 正文：实验内容，实验方法，仿真结果……

格式要求：

- 标题：醒目、各级标题大小不同
- 正文：中文宋体/英文Times New Roman，小4号，1.2倍行间距，段前空2格；图、表标题不可缺。

英文小论文要求

和实验报告一起，1月17日上交
jiangyongkai@zjut.edu.cn

主题：**结合自己的科研内容+电力电子相关技术**

格式要求：

IEEE 期刊论文格式：标题、作者、摘要、引言、研究内容、研究方法、分析、结论、参考文献。

清晰美观