## 邊界元素法1999第九次作業

1．In the book of Chen and Zhou，the Calderon projectors are defined by

$$
\begin{align*}
& {\left[C_{1}\right]=\left[\begin{array}{cc}
\frac{1}{2}[I]-[T] & {[U]} \\
-[M] & \frac{1}{2}[I]+[L]
\end{array}\right]}  \tag{1}\\
& {\left[C_{2}\right]=\left[\begin{array}{cc}
\frac{1}{2}[I]+[T] & -[U] \\
+[M] & \frac{1}{2}[I]-[L]
\end{array}\right]} \tag{2}
\end{align*}
$$

The Calderon identities are

$$
\begin{aligned}
& {\left[C_{1}\right]+\left[C_{2}\right]=[I]} \\
& {\left[C_{1}\right]^{2}=\left[C_{1}\right]} \\
& {\left[C_{1}\right]\left[C_{2}\right]=\left[C_{2}\right]\left[C_{1}\right]=0}
\end{aligned}
$$

The relations between potential opeartors are shown below：

$$
\begin{aligned}
& -\frac{1}{4}[I]+[T]^{2}-[U][M]=0 \\
& {[U][L]=[T][U]} \\
& {[M][T]=[L][M]} \\
& -\frac{1}{4}[I]+[L]^{2}-[M][U]=0
\end{aligned}
$$

（1）．Derive the above identities by using

$$
\begin{aligned}
& {\left[U^{i}\right]\{t\}=\left[T^{i}\right]\{u\}} \\
& {\left[L^{i}\right]\{t\}=\left[M^{i}\right]\{u\}}
\end{aligned}
$$

where

$$
\begin{aligned}
& {\left[U^{i}\right]=\left[U^{e}\right]=[U]} \\
& {[T]=\left[T^{i}\right]+\frac{1}{2}[I]=\left[T^{e}\right]-\frac{1}{2}[I]} \\
& {[L]=\left[L^{i}\right]-\frac{1}{2}[I]=\left[L^{e}\right]+\frac{1}{2}[I]}
\end{aligned}
$$

（2）．Using the circulants for a two－dimesional circular domain，please prove the Calderon projector property．
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