


# Notes on the Inverse FMM code

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$O_{18}$	$O_{17}$	$O_{16}$	$O_{15}$	$O_{14}$	$O_{13}$	$O_{12}$
$O_{19}$	$I_{12}$	$I_{11}$	$I_{10}$	$I_9$	$I_8$	$O_{11}$
$O_{20}$	$I_{13}$	$N_6$	$N_5$	$N_4$	$I_7$	$O_{10}$
$O_{21}$	$I_{14}$	$N_7$	$C_3$	$C_2$	$N_3$	$I_6$
			$C_0$	$C_1$		$O_9$
$O_{22}$	$I_{15}$	$N_0$	$N_1$	$N_2$	$I_5$	$O_8$
$O_{23}$	$I_0$	$I_1$	$I_2$	$I_3$	$I_4$	$O_7$
$O_0$	$O_1$	$O_2$	$O_3$	$O_4$	$O_5$	$O_6$

Figure 1: Different interaction lists for the cluster 

## 1 Matrix of different interactions

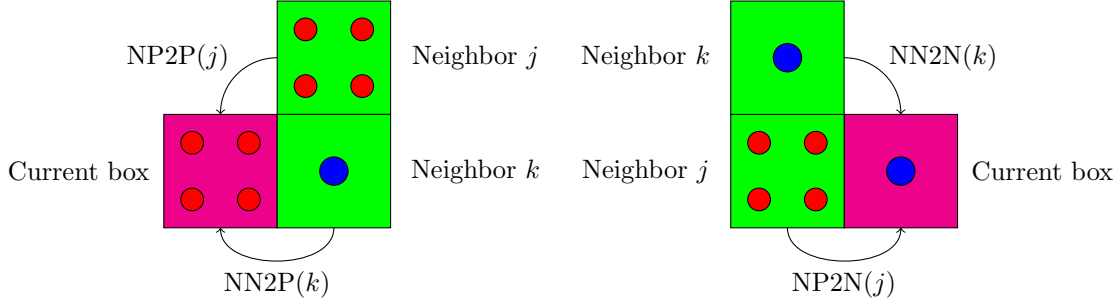
In the subsequent pictures, the **particles will be denoted by a red circle**, whereas the **lumped nodes will be denoted by cyan circles**. The following matrices mentioned in the table need to be stored for each box. Note that apart from the self interactions, the rest of the interactions store the incoming field (i.e., the map from charges to potentials) from each neighbor and well-separated box.

### 1.1 Self interactions

P2P	Potential on particles due to particles
N2P	Interpolated potential on particles due to potential on nodes
P2N	Anterpolated charges on nodes due to charges on particles
N2N	Potential on nodes due to nodes

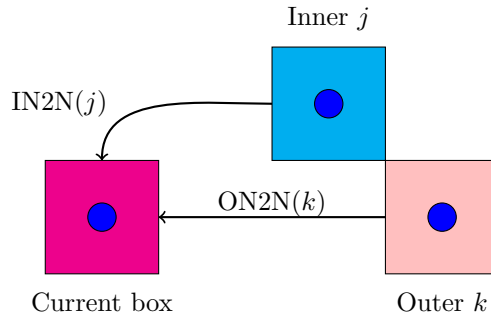
## 1.2 Interaction with neighbors

NP2P( $j$ )	Potential on particles due to particles in neighbor $j$
NN2P( $j$ )	Potential on particles due to nodes in neighbor $j$
NP2N( $j$ )	Potential on nodes due to particles in neighbor $j$
NN2N( $j$ )	Potential on nodes due to nodes in neighbor $j$



## 1.3 Interaction with well-separated

IN2N( $j$ )	Potential on nodes due to nodes in inner well-separated cluster $j$
ON2N( $j$ )	Potential on nodes due to nodes in outer well-separated cluster $k$



O <sub>18</sub>	O <sub>17</sub>	O <sub>16</sub>	O <sub>15</sub>	O <sub>14</sub>	O <sub>13</sub>	O <sub>12</sub>
O <sub>19</sub>	I <sub>12</sub>	I <sub>11</sub>	I <sub>10</sub>	I <sub>9</sub>	I <sub>8</sub>	O <sub>11</sub>
O <sub>20</sub>	I <sub>13</sub>	N <sub>6</sub>	N <sub>5</sub>	N <sub>4</sub>	I <sub>7</sub>	O <sub>10</sub>
O <sub>21</sub>	I <sub>14</sub>	N <sub>7</sub>	✗	N <sub>3</sub>	I <sub>6</sub>	O <sub>9</sub>
O <sub>22</sub>	I <sub>15</sub>	N <sub>0</sub>	N <sub>1</sub>	N <sub>2</sub>	I <sub>5</sub>	O <sub>8</sub>
O <sub>23</sub>	I <sub>0</sub>	I <sub>1</sub>	I <sub>2</sub>	I <sub>3</sub>	I <sub>4</sub>	O <sub>7</sub>
O <sub>0</sub>	O <sub>1</sub>	O <sub>2</sub>	O <sub>3</sub>	O <sub>4</sub>	O <sub>5</sub>	O <sub>6</sub>

Figure 2: Different interaction lists for child0 ✗

O <sub>18</sub>	O <sub>17</sub>	O <sub>16</sub>	O <sub>15</sub>	O <sub>14</sub>	O <sub>13</sub>	O <sub>12</sub>
O <sub>19</sub>	I <sub>12</sub>	I <sub>11</sub>	I <sub>10</sub>	I <sub>9</sub>	I <sub>8</sub>	O <sub>11</sub>
O <sub>20</sub>	I <sub>13</sub>	N <sub>6</sub>	N <sub>5</sub>	N <sub>4</sub>	I <sub>7</sub>	O <sub>10</sub>
O <sub>21</sub>	I <sub>14</sub>	N <sub>7</sub>	✗	N <sub>3</sub>	I <sub>6</sub>	O <sub>9</sub>
O <sub>22</sub>	I <sub>15</sub>	N <sub>0</sub>	N <sub>1</sub>	N <sub>2</sub>	I <sub>5</sub>	O <sub>8</sub>
O <sub>23</sub>	I <sub>0</sub>	I <sub>1</sub>	I <sub>2</sub>	I <sub>3</sub>	I <sub>4</sub>	O <sub>7</sub>
O <sub>0</sub>	O <sub>1</sub>	O <sub>2</sub>	O <sub>3</sub>	O <sub>4</sub>	O <sub>5</sub>	O <sub>6</sub>

Figure 3: Different interaction lists for child1 ✗

O <sub>18</sub>	O <sub>17</sub>	O <sub>16</sub>	O <sub>15</sub>	O <sub>14</sub>	O <sub>13</sub>	O <sub>12</sub>
O <sub>19</sub>	I <sub>12</sub>	I <sub>11</sub>	I <sub>10</sub>	I <sub>9</sub>	I <sub>8</sub>	O <sub>11</sub>
O <sub>20</sub>	I <sub>13</sub>	N <sub>6</sub>	N <sub>5</sub>	N <sub>4</sub>	I <sub>7</sub>	O <sub>10</sub>
O <sub>21</sub>	I <sub>14</sub>	N <sub>7</sub>	✕	N <sub>3</sub>	I <sub>6</sub>	O <sub>9</sub>
O <sub>22</sub>	I <sub>15</sub>	N <sub>0</sub>	N <sub>1</sub>	N <sub>2</sub>	I <sub>5</sub>	O <sub>8</sub>
O <sub>23</sub>	I <sub>0</sub>	I <sub>1</sub>	I <sub>2</sub>	I <sub>3</sub>	I <sub>4</sub>	O <sub>7</sub>
O <sub>0</sub>	O <sub>1</sub>	O <sub>2</sub>	O <sub>3</sub>	O <sub>4</sub>	O <sub>5</sub>	O <sub>6</sub>

Figure 4: Different interaction lists for child2 ✕

O <sub>18</sub>	O <sub>17</sub>	O <sub>16</sub>	O <sub>15</sub>	O <sub>14</sub>	O <sub>13</sub>	O <sub>12</sub>
O <sub>19</sub>	I <sub>12</sub>	I <sub>11</sub>	I <sub>10</sub>	I <sub>9</sub>	I <sub>8</sub>	O <sub>11</sub>
O <sub>20</sub>	I <sub>13</sub>	N <sub>6</sub>	N <sub>5</sub>	N <sub>4</sub>	I <sub>7</sub>	O <sub>10</sub>
O <sub>21</sub>	I <sub>14</sub>	N <sub>7</sub>	✕	N <sub>3</sub>	I <sub>6</sub>	O <sub>9</sub>
O <sub>22</sub>	I <sub>15</sub>	N <sub>0</sub>	N <sub>1</sub>	N <sub>2</sub>	I <sub>5</sub>	O <sub>8</sub>
O <sub>23</sub>	I <sub>0</sub>	I <sub>1</sub>	I <sub>2</sub>	I <sub>3</sub>	I <sub>4</sub>	O <sub>7</sub>
O <sub>0</sub>	O <sub>1</sub>	O <sub>2</sub>	O <sub>3</sub>	O <sub>4</sub>	O <sub>5</sub>	O <sub>6</sub>

Figure 5: Different interaction lists for child3 ✕