Changes to the manuscript:

A multivariate form of Hardy's inequality and L_p-error bounds for multivariate Lagrange interpolation schemes

Some notational changes

(1.) The constant

$$\frac{\Gamma(m-n/p)}{\Gamma(m)\Gamma(\#\Theta+m-n/p)}$$

(occurring in Theorem 3.2.1) is written in the form

$$\frac{1}{(m-1)!(m-n/p)_{\#\Theta}},$$

which makes clear how it is to be calculated. In the same vein, quotients of Gamma functions are expressed as shifted factorials whenever possible.

(2.) As suggested by a referee, the expression for $M(t|\Theta)$ in Remark 2.1.4 was corrected. Note the clarification of the meaning of $\det A$ (now written as $\det(A|)$).

(3.) The map $L_{m,\Theta}$ in (3.2.2) was changed to $H_{m,\Theta}$ (H for Hardy).

Additional results included

(1.) Example 2.1.8, which is used in the proof of Lemma 3.1.1, and to get sharpness in Theorem 3.2.1, has been added.

(2.) The main result, Theorem 3.2.1, is shown to be sharp in the case when Θ consists of a single point (possibly repeated many times). This calculation depends on Example 2.1.8 (see (1.) above). It is also shown for $\Omega \subset \Omega'$ that

$$\|H_{m,\Theta}\|_{L_p(\Omega)} \leq \|H_{m,\Theta}\|_{L_p(\Omega')}.$$

(3.) The constant

$$C_{n,p,j,k,m} := \frac{(m+j)!}{\Gamma(k+1-n/p)} \sum_{i=k-m-j}^{k} \binom{i-1}{m+j+i-k} \frac{\Gamma(k+1-i-n/p)}{(k-i)!},$$

occurring in Theorem 4.3.1 is shown to be equal to

$$\frac{1}{(1-n/p)_{k-m-j}}$$

by using the Chu-Vandermonde convolution identity (for sums of hypergeometric functions).

Changes to proofs

(1.) The proof of Lemma 3.1.1 was streamlined by the introduction of Example 2.1.8.

(2.) The proof of Theorem 3.2.1 was modified so that it addresses the measurability of $H_{m,\Theta} f$ (which was ignored in the earlier version). The proof now includes additional information about the sharpness of the multivariate form of Hardy's inequality (see additional results included (2.)).

(3.) The proof of Theorem 3.4.1 was corrected in line with the referee's comments.

Action on the comments of referee #1

1. The 'wlog' is now spelled out in full.

2. The manuscript has now been prepared with the SIAM format files.

Action on the comments of referee #2

0. The reference to Hardy's inequality in the title has been retained. Since the inequality is now known to be sharp when Θ consists of a single point, this usage is better justified.

1. It has been made clear which results are new, and which are old.

2. Only the proofs of the main results remain. Proposition 1.3.1 (and its proof - which is subtle) has been retained, due to its bearing on the general problem of obtaining L_p-error bounds (which is the paper is directed towards).

3. The proof (which had mistaken claims in it as pointed out by this referee) has been corrected.

4. - 6. Corrected.

7. The Hakopian map does interpolate function values. Since it is, as the referee points out, not obvious that the point evaluations lie in the space of interpolation conditions for the Hakopian map as presented, a comment to this effect has been added.